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THE ELECTRIC VEHICLE SITUATION.

This week's convention of the Electric Vehicle Association of America demonstrates anew the difficulty of the task of bringing into co-operation the diversified interests which must work in harmony if the electric vehicle is to be properly exploited. It is almost amusing to note the pressure being brought to bear on the central-station industry by manufacturer, user and garage owner alike; the one to get the central station to introduce his product, the second to give him a preferential rate and the last to subsidize him. This condition is not favorable for the electric-vehicle industry. Certainly gasoline machines would never have attained their present popularity if those commercially interested had spent their time in criticizing in turn the distiller of gasoline, the makers of dry cells and all contributing to the manufacture, sale and operation of the automobile. The central-station industry has given of its time, thought and money to further the interest of the electric vehicle. It has been responsible for much of the progress achieved in the last three years and even in the face of the meager returns thus far has shown no decrease in interest. The discussion at the meetings in New York showed that there were blows to give as well as blows to take, and the net result was by no means unfavorable to the central station. What is sorely needed is real enthusiasm on the part of all in a general forward movement in which petty commercial differences will be adjusted for the common good. Aside from harmonizing conflicting interests what is now sorely needed in the electric-vehicle campaign are reliable operating data. There has been a surfeit of generalities and of glittering statement, and it is surely time to replace publicity metaphysics with prosy business exploitation. In no way can the Electric Vehicle Association of America better achieve its ends than by placing in the hands of every central station data on the results already obtained in electric-vehicle practice. Facts are stubborn things and these the central-station industry needs in the present stage of electric-vehicle exploitation. Progress is certainly being made, but it is possible for it to be made faster, and enthusiastic concerted action and reliable operating data are the best means to this end.

VISUAL ACUITY WITH COLORED LIGHTS.

The brief paper by Mr. Dow in the current issue points out some of the complications encountered when one attempts to determine visual acuity for lights of different colors. The recent investigations of acuity with light approximately or fully monochromatic show clearly enough that, other things being equal, the effect of monochromatism is a considerable increase in acuity owing to the abolition of the chromatic aberration of the eye. This point

seems to be fully established, but the subsidiary question as to whether one kind of monochromatic light is materially greater in its power of revealing detail than another is, as regards the eye, still unsettled. Mr. Dow points out that, owing to the different positions of the focal surfaces in the eye for objects at different distances, and for the eye in different stages of accommodation, vision may be made easier or more difficult for monochromatic light of any particular kind. In very near vision good definition can be had by violet monochromatic light, when by red light it would be very indistinct. At considerable distances, and particularly if the eye is slightly myopic, vision by red light is easier than by blue. If an observer wears glasses the particular color seen with the easiest accommodation at any particular distance depends on the power of the glasses employed. The differences induced by difference of focus with respect to possible accommodation are large, certainly larger than any differences due to the mere difference of wave length in the lights employed. This is well shown in some of the experiments of Mr. Luckiesh to which Mr. Dow refers.

Mr. Luckiesh conducted his acuity tests at a distance of about 1 m, a very convenient one for the particular acuity target employed. Two of the observers, however, who wore glasses, obtained results differing radically from those reached by the others. Now the fact is that when the errors of refraction in an eye are corrected by the oculist they are customarily either corrected for distant vision or for a reading distance of about 14 in. It is only in very unusual cases that spectacles for a working distance as long as 1 m are prescribed, and consequently these observers undoubtedly fell into just the difficulty that Mr. Dow indicates, of having the focal images fall in the wrong place for easy accommodation with the glasses used; hence the discordant readings which resulted. Had these experiments been directed to the comparison of monochromatic lights of various colors the same sort of errors would have been likely to enter. Considering these facts, one can compare the effect of lights of different colors properly only when working at a distance which permits of effective accommodation for any of the colors compared or when using correcting glasses which will bring these colors within comfortable range of accommodation.

According to Lord Rayleigh's theory of optical instruments, the eye should give somewhat better resolving power for short wave lengths than for long. Such is, no doubt, the case, but the practical phase of the matter is whether, considering the actual imperfections of the eye as an optical instrument, this difference can be made apparent. It certainly cannot be made apparent, to judge from Mr. Dow's experiments, unless correcting lenses are employed to bring each of the colors compared within range of accommodation. Even if this is done, the eye is subject to spherical aberration, to the diffusion of more or less light, very generally to small degrees of astigmatism often too small to be worth correcting for ordinary purposes—and to zonal aberrations which may appear when there is a great change in the aperture of the pupil. Whether the theoretical differences of resolving power can be made evident in spite of this complex of errors of refraction seems somewhat doubtful. At all events, it has never yet been demonstrated. The gain from using monochromatic light, provided the color is such as to fall, or easily be brought, within the range of accommodation, appears, however, to be well established. Inasmuch as monochromatic light can be obtained at fair efficiency only through a limited range of the spectrum the more intricate question just raised is chiefly of academic interest. In photomicrography there is a considerable gain by the use of violet or even ultraviolet light, but this is a totally different matter, since the microscope can be easily focused for any required wave length and is very much more perfect optically and better corrected for chromatic and spherical aberrations than is the eye.

UNSATISFACTORY ILLUMINATION OF FEDERAL BUILDINGS.

In the course of a recent address before the Electric Club of Chicago Mr. L. B. Marks, who, as an engineer of repute and the first president of the Illuminating Engineering Society, should know what he is talking about, charged that the neglect of the simplest principles of good illumination by the Treasury Department of the United States Government is "absolutely disgraceful." The situation, as described by Mr. Marks, is serious, because the Treasury Department has custody of a very large number of federal buildings scattered throughout the country, and the lighting of these public buildings, instead of being an example to others, is only too often crude, harsh and inartistic. Usually the federal buildings—the postoffices, custom houses, court houses and structures of similar purpose—are prominently placed in the various communities served and frequently they are structures of considerable architectural pretension. It is, therefore, particularly to be regretted that the lighting of these buildings falls so far behind the standard set by the work of engineers who have made a careful study of the practical applications of illumination.

Of course, Mr. Marks' criticism might have embraced a much wider field, for the examples of scientific illumination to be found in any class of buildings are few in number as yet. But the government buildings are so conspicuous, and, in the case of postoffices, so close to the life of the people, that it is a pity that any department which is responsible for them should exhibit what is apparently contempt for the work of the illuminating engineer. The efforts thus slighted are indeed important, for it is certain that the study of problems of illumination that has been made by engineers in recent years has made possible better illumination. More intelligent lighting means, among other things, decrease in eye strain; and as the number of Americans with defective eyesight is so great as to be alarming this one aspect of illuminating engineering is of very great importance. If, as is said to be the case in the Treasury Department building at Washington—to cite one example—bare lamps are used in the field of vision, it is high time that an effort be made to arouse this department of the government from its complacent lethargy.

It is charged that the salaries paid by the government to the men in the Treasury Department responsible for interior illumination are entirely inadequate. Ample funds

seem to be available for what may be spoken of as architectural exuberances and experiments in federal buildings, but such a practical necessity as good illumination seems to be the Cinderella among the arts in the opinion of the architects and custodians of the Treasury Department. This ought not to be so, but, as remarked by one of the speakers during the discussion in Chicago, so long as the engineering public acquiesces in the existing condition of affairs the situation will probably continue. If the engineers would interest themselves sufficiently to agitate for better illumination in public buildings the people would undoubtedly recognize the justice of the complaint, and, through their representatives in Congress, bring about a reform.

IMPROVEMENTS IN FLAMING-ARC LAMPS.

The flaming-arc lamp, despite its enormous light-giving efficiency, has never made in this country anything like the headway which it has always secured abroad. The fundamental difficulty appears to have been the short life of the electrodes, for the one thing dearest to the heart of the American central-station manager is a long-burning lamp, and this the ordinary flame arc is not. Electrical practice has not yet wholly broken away from the feeling that a lamp is a lamp if it looks tolerably bright, regardless of efficiency, and no light-giving power, however great per watt, can really excuse in the popular mind the vice of short burning-hours. Rather recently there has been a determined effort both here and abroad to overcome this particular difficulty with the flaming arc and to produce a lamp not only able to give a high luminous efficiency, but requiring only infrequent trimming. The usual forms of flaming arc have in the main required trimming every night, and hence their care has been rather expensive per lamp-hour even if still modest per candle-power-hour.

Some three years ago the Jandus "regenerative" lamp, first brought out in England, made a long stride toward the solution of the life difficulty, in this case by reverting to the principle of the inclosed arc, but providing ventilating flues for carrying off the solid products of combustion and space for their deposit where they would be out of the way. Despite some crudities in the early lamps of this make, the main object of the innovation was attained, in that the life of the electrodes increased to 80 hours, while still retaining an efficiency materially greater than that of any arc lamp using other than flame electrodes. Since then a considerable group of long-burning flame lamps has appeared, most of them using the principle of close inclosure, although the various examples differ materially in actual mechanism and in the provisions made for disposing of the products of combustion. Whatever the failings of the carbon arc, it has one conspicuous merit in that the products of combustion are gaseous, colorless and odorless. All the usual types of flaming arcs produce a dense white deposit of oxides, which, if not carried off by suitable ventilating arrangements, soon clog the mechanism and befog the globe. The electrodes in use in these modern long-burning lamps are all typically flame electrodes, although varying slightly in composition. The requisite burning time has been generally attained by increasing either the length or the diameter of the electrode, by varying its composition or by some combination of these three factors. Long burning secured by extreme length of electrode is apt to lead to a somewhat unsightly and clumsy lamp. Life due to increased diameter tends to unsteadiness, while it reached through any radical change in the composition of the electrodes by the addition of restraining substances, the punishment is inefficiency.

The proposition of using a highly efficient flaming arc with electrodes enduring from 75 to 100 or more hours is certainly a very attractive one. It is attractive in the same way as the original inclosed arc, which forced its way into practice a dozen years ago. Like the old inclosed arc, too, the new lamps are very generally capable of construction for both direct and alternating current, which is a great convenience. The final result of the innovation appears very hopeful. The time has gone by when long burning at the expense of efficiency will be tolerated by the public, even if one should find managers willing to try it. The objection to the inclosed-flame lamp, irrespective of its particular form, is chiefly the temptation that will be manifest toward reaching a long life at the expense of efficiency. It is quite certain that 75 to 100 hours may be reached while still retaining excellent luminous return for the output required. If the manufacturers and users have strength of mind enough to let the matter rest there, the art will have been enriched by a very useful type of illuminant. We foresee, however, that some back county will call for a lamp of greater life, and call so loudly that lamp makers will, unless endowed with unusual fortitude, listen and yield, with the result of loud claims for the longest-burning lamp on earth and a sudden hush when categorical inquiries are made as to the efficiency. The solemn fact is that one cannot have one's cake and eat it, too, in arc-lamp practice or anywhere else.

If one has, let us say, 100 grams of highly efficient electrode and burns it under conditions that give it a very long life he will not get the same luminous flux as if he had burned the same amount of light-giving material in a shorter time. If he attempts to dodge the issue by juggling with the composition the result is generally worse, and every step taken to increase life by such means is usually a step backward as far as luminous efficiency goes. It may be possible to get an improved electrode better than any we now have and still giving a long life, but the same electrode burned intensively will go to a much higher efficiency. In other words, great as the advantage of long life is from a practical standpoint, and promising as are some of the lamps now available, particularly for use with alternating current, one must be constantly watchful lest the same temptations that led to the downfall of the inclosed carbon arc may bring to grief the inclosed flaming arc. Its development is beginning in a very promising manner, and it will be a subject for genuine regret if failure should come through over-insistence on extreme burning life. It is a case where it would be desirable to proceed very cautiously, and to watch with a jealous eye the maintenance of that luminous efficiency which has given the flaming arc in general its present conspicuous position.

Contents of Huge Storage Reservoir of LaCrosse Water Power Company Sweep Black River Valley in Wisconsin.

Damage estimated at more than one million dollars is reported in the valley of the Black River of Wisconsin, following the release of a deluge of water by the hydraulic works of the LaCrosse Water Power Company at Hatfield, Oct. 6. Heavy rains in the vicinity had caused the rise of the upper reservoir of the company at Dells, and an earth-wall of this dam is reported to have given way, in spite of the efforts of 300 workmen, discharging its flood upon the main Hatfield dam, 5 miles below. Fortunately this concrete structure, 50 ft. high and 500 ft. long, held securely even with a sheet of water 13 ft. thick pouring over its crest and over the earth dykes at the ends of the dam and the raging waters continued 15 miles downstream to the village of Black River Falls, where the principal damage was done. At Black River Falls a municipal water-power dam and plant had been erected (described in the *Electrical World*, June 1, 1911), and the backwater and eddies caused by this dam are said to have deflected the flood through the principal part of the town, destroying most of the business blocks and rendering many of the 2000 inhabitants homeless. The municipal plant was completely demolished.

The 8500-kw plant of the LaCrosse Water Power Company at Hatfield is in point of reservoir capacity and head one of the largest, if not the largest, hydroelectric undertakings in the Middle Western States. Its two great reservoirs comprise hundreds of acres of pond area, and its water-wheels utilize an available head of 91 ft. to 100 ft. The plant is near Hatfield, approximately 50 miles from the cities of LaCrosse, Wis., and Winona, Minn., both of which obtain electrical energy from the 8500-kw station over a joint transmission line. The principal water storage of the power company's plant was the Dells reservoir, where a comparatively low-head dam impounded a huge area, normally discharging through its concrete head gates and spillway into the old river bed, which was in turn flooded by the principal Hatfield dam 5 miles below. The Dells dam was thus relied upon only for season storage, and it was this dam, according to the accounts received, which suffered an injury to one of its earth wing-walls, discharging its water suddenly into the lower reservoir. The lower reservoir, closed by the 50-ft. Hatfield dam and having an area of nearly 700 acres, is of an average depth of 50 ft., 10 ft. of which is available for draw-down. From the northwest end of the Hatfield dam to the power house, 13,000 ft. distant, was led the power canal, 100 ft. wide, cut into the side slope of the valley. In the effort to relieve the pressure on the main dam this canal is reported to have been dynamited. The power house, of brick, steel and concrete, measures 146 ft. by 57 ft. in plan and provides for four 2400-kw water-wheel generators, two of which are installed. A total head of 91 ft. or more is available at the power house through the construction of the supply canal,

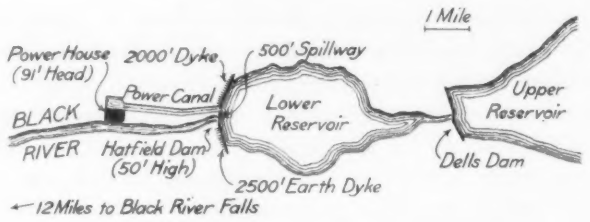


Fig. 2—Map of LaCrosse Water-Power Development.

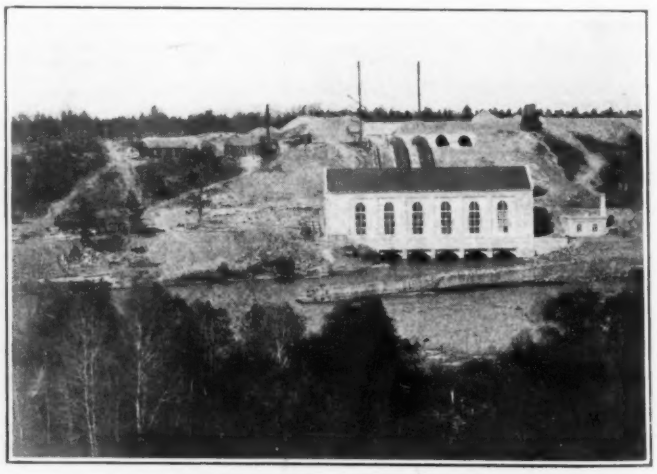
2.5 miles in length from the dam. During the flood operation of the water-power plant was, of course, interrupted, and auxiliary steam plants were started up at LaCrosse and Winona.

Not only was the flood in the river a big one, but the quantity of water flowing in the river was more than doubled, perhaps trebled, for a short time by the emptying of the Dells reservoir. The Dells dam was constructed subsequent to the Hatfield dam and, of course, no provision was made at the Hatfield dam to protect from any flood greater than that which would naturally occur in the river. The Hatfield dam has a spillway 489 ft. long and the dikes were built 12 ft. higher than the crest of the dam. A flood of 60,000 or 70,000 second feet, therefore, could have been safely passed over the dam. This would have been an extremely large amount of water from a drainage area of 1264 sq. miles located in a district of low rainfall. A complete illustrated description of the LaCrosse Water Power Company's development appeared in these columns March 31, 1910.

While the flood which rushed down the Black River valley was not of the overwhelming proportions of the Austin, Pa., disaster, the water at points below rose rapidly to a stage of 40 ft. or more almost without warning. Had the main Hatfield dam failed under the terrific strain of discharging the flood over it (which reached a depth of 13 ft. along its 500-ft. spillway) it is impossible to guess what might have been the extent of the calamity in the towns below through the sudden release of this additional huge quantity of water. The water-power company had been fighting the rising waters in the upper reservoir for a week, and had made desperate efforts to reinforce the weakened dyke which later failed.

The municipal-plant dam at Black River Falls, which is held partially responsible for the local damage in holding back the tremendous discharge of water which struck it without warning, was a concrete structure developing a head of 18 ft. Although designed for a total capacity of

Fig. 1—Hatfield Dam Before the Flood.



LaCrosse Power Station from East Side of River.

800 kw, the first 400-kw unit was installed, driven by one of a future pair of 400-hp runners, sufficient for carrying the present load on the plant. During the worst of the flood the main streets of the town were 20 ft. to 30 ft. under water and the foundations of many buildings were swept away, the structures themselves tumbling into the flood. In spite of the property damage no losses of life are confirmed. Several instances of personal courage were reported during the disaster. As soon as the caretaker of the upper Dells dam discovered the break he rode desperately throughout the night warning occupants of imperiled homes to seek higher ground. For hours the flood-stricken towns were cut off from communication with the outside world until telephone linemen swam to and climbed the poles of the remaining lines, reporting the disaster through their test sets. Mr. W. J. Ferris, formerly of Chicago, is president and general manager of the LaCrosse Water Power Company, and Mr. W. S. Woods is chief engineer.

Boston Electric Vehicle Club.

The weekly luncheon and meeting of the Electric Vehicle Club of Boston was held at the Edison Building in that city Wednesday noon, Oct. 4. Mr. Herbert W. Moses, manager of the 1912 Boston Electric Show, was chosen chairman of the meeting.

Secretary L. D. Gibbs explained the plans of the Boston Edison Company for a flashing electric vehicle sign on Boylston Street, Boston. Mr. Whiting, for the committee on co-operative advertising, urged the importance of enthusiasm in the campaign now going on. Mr. Day Baker suggested that plans for the co-operative advertising be made known well in advance, so that agents could secure adequate appropriations for the purpose from their firms.

Mr. A. F. Neale, of the Baker Motor Vehicle Company; Mr. Baker, of the General Vehicle Company; Mr. Whiting, for the Bailey Company, and Mr. Emery for the Walker Vehicle Company, all stated that they would take space each week. Other dealers and agents are expected to come into the campaign in a short time.

On motion of Mr. Mansfield it was voted that the secretary be instructed to write the president of the Electric Vehicle Association of America stating that the club had voted unanimously to join with the New England Section of the Electric Vehicle Association of America and the Edison Electric Illuminating Company, of Boston, in inviting the national association to hold its annual convention in Boston next year during the 1912 Electric Show.

Mr. Frank J. Stone outlined plans to increase the interest in the electric vehicle, which include a banquet, to which the Governor and city officials will be invited, and the plan was adopted by vote of the club and a committee of five appointed to take charge of the matter.

It was announced that sixty-one new electric vehicles have been sold in Newark, N. J., since the electric vehicle campaign was opened there.

Mr. Baker reported that a 1-ton gasoline truck cost $3,270 for repairs in one year, and the average haul was but 28 miles per day. Mr. Eldredge cited the case of a gasoline car that was in use fourteen months on which the repairs cost over $2,000. He stated that from conversations with gasoline truck owners all over New England he knew of none that was economical on the basis of ton-miles. The next meeting will be held Oct. 18.

A flashlight photograph was taken of the members in attendance at the meeting. The club was started as a result of the indorsement of electric vehicles by the Boston Edison Company. It has been a valuable adjunct in the campaign and gives an opportunity for the interchange of ideas and information by vehicle agents in Boston and vicinity. From twenty to thirty-five men are in attendance at the weekly luncheons furnished by the Edison Company at its building.

Santa Rosalia, Mexico, Hydroelectric Plant.

The Mexican Northern Power Company, composed of Canadians, which is constructing a great hydroelectric enterprise on the Conchos River, 25 miles distant from Santa Rosalia, Chihuahua, now has more than 1000 men employed in the work. The dam is partly finished. Besides storing water for operating the proposed hydroelectric plant, which is to have a capacity of about 50,000 hp, it will be the means of affording a water supply for irrigating 200,000 acres of land situated in the valley of the Conchos River. The company is operating under favorable concessions granted by the state and federal governments. It began construction work about two years ago and carried it on steadily until the outbreak of the revolution last fall. For several months a shortage of labor interrupted operations, but this condition is now relieved, and it is announced that the big enterprise will be finished by June, 1913. The project involves the expenditure of about $15,000,000 gold, making it one of the most important foreign industrial works now in progress in Mexico. In order to afford transportation facilities for conveying material and supplies to the construction camp a standard-gage railroad was constructed from Santa Rosalia to the dam site, a distance of 22 miles. The electric-transmission lines from the hydroelectric plant will run to the cities of Chihuahua, Parral, Jiminez and a number of smaller towns, as well as to many of the principal mining camps of the State.

Convention of Iron and Steel Electrical Engineers

An account of the first three days' sessions of the Association of Iron and Steel Electrical Engineers, which met in convention at the Hotel Imperial, New York City, Sept. 25-30, was published in last week's issue. Three papers were read at Thursday morning's session as follows: "Design of Electrically Driven Central Pumping Station," by Mr. F. W. McKee, of the Jones & Laughlin Steel Company; "The Regulating Storage Battery in Steel Works Service," by Mr. F. W. Woodhull, of the Lukens Iron & Steel Company, and "Prime Movers in Central Power Stations," by a representative of the Westinghouse Machine Company. As pointed out last week abstracts of papers and discussions are withheld until after their appearance in the transactions of the association. On Thursday afternoon a visit was made to the works of the Crocker-Wheeler Company at Ampere, N. J.

On Friday morning the association was the guest of the General Electric Company at its Harrison lamp works and a luncheon was served in the Hotel Martinique when the visitors returned to New York. The Friday afternoon session was given over to a consideration of lighting for steel mills, Messrs. S. R. Fortune, of the Cooper Hewitt Electric Company; C. J. Mundo, of the General Electric Company, and W. Harrison, of the National Electric Lamp Association, presenting papers in which the respective products of their companies were extolled. A paper was also prepared on steel-mill illumination by Mr. H. M. Gassman, of the Tennessee Coal, Iron & Railroad Company. The paper was read by Mr. B. R. Shover, who also discussed the subject of steel-mill lighting at some length. Mr. Gassman called attention to the defects of arc lamps and of flaming-arc lamps for steel-mill service and favored in their stead the installation of tungsten lamps of large size rather than clusters of smaller tungsten lamps. His company had made the substitution with profit. Mr. Shover cited some tests made on 50-volt and 100-volt, 40-watt tung-

sten lamps by the Carnegie Steel Company. The lamps were placed in a machine which subjected them to shock and the results given by Mr. Shover showed that the lower voltage lamp was more rugged, withstanding on an average 11,505 shocks to 3697 shocks by the 100-volt lamps.

It was decided to hold the next annual meeting of the association during the last week in September, and Boston, Washington, Detroit and Milwaukee were considered as being desirable cities in which to convene, the last-named city having the most advocates. No definite city was chosen, however, the matter being left to the executive committee.

Annual Meeting of the Empire State Association.

The annual meeting of the Empire State Gas & Electric Association was held on Oct. 6 at the Engineering Societies Building, New York City. In the absence of the president, Mr. M. J. Brayton, Utica, it was called to order at 10 a. m. by Mr. R. M. Searle, of Rochester. The reading of the minutes of the previous meeting was dispensed with, and Mr. C. H. B. Chapin, the secretary, then read the report of the executive committee. The report of the treasurer, Mr. A. B. Beadle, New York, was then presented.

Mr. C. G. Durfee, Rochester, presented the report of the committee on electric meters. Among various matters discussed the committee brought out the fact that several manufacturers had placed on the market recently meters of small capacity which, while being accurate to a high degree, are much cheaper than the older types. The committee considered that these would be helpful to the various companies, particularly the smaller companies, and would enable them to replace gradually old types of meters with new types and especially to substitute induction meters for the commutator type meters on alternating-current circuits. It was urged by the committee that companies that are not making periodic tests of meters in service should introduce this practice, as it would certainly be to their advantage to do so.

Mr. T. R. Beal, of Poughkeepsie, presented the report of the committee on taxation, which gave a summary of laws or recent amendments to existing statutes relating to this subject.

In the discussion on the subject by this committee Mr. R. M. Searle suggested for serious consideration by the companies a plan whereby the taxes may be shown on each bill rendered to a consumer. That is to say, the total amount of each customer's bill would be divided between the total charge for the service and the proportionate taxes which would accure in each case. The Rochester Railway & Light Company, Mr. Searle added, would be perfectly willing to introduce a system of this character, believing that it would show the facts in relation to questions of taxation more clearly than any other means that have been considered. Mr. Searle added that the present form in which taxes are levied upon public-utility companies is a form of indirect tax upon the community, because whatever taxes are levied are added in turn to the cost of the service rendered. However, as taxes are now levied they are not shown in such detail that the consumers realize the extent to which they are burdened. If a public-utility company pays an amount of taxes in a community greater in proportion than other companies or individuals, it simply collects the taxes from its customers. The larger the tax is in the aggregate, the larger the provision that must be made in expenses for its payment. To levy the tax in this indirect manner compels resident householders to pay a larger proportionate tax than alien owners of property. The members felt that they would like to study the subject and Mr. Searle was asked to submit his remarks in printed form in order that they may be given further consideration.

Mr. E. C. Scobell, Rochester, chairman of the committee on accounting, reported verbally that the committee is suggesting to the State Board of Tax Commissioners and the New York Public Service Commission, Second District, the advantages of making their forms of report uniform as far as possible. The committee is working to have the form of report simplified as much as possible, and, if feasible, to have the details reduced in number.

Attention was called by their committee to the fact that if advantage is to be taken of the amendment to Section 69 of the Public-Service Commission's law relating to the issue of securities for reimbursement of the treasury, application should be made prior to Jan. 1, 1912.

In the discussion which followed the presentation of the report of the committee on accounting one of the members called attention to the proposed order of the Public Service Commission, Second District, in reference to the numbering of poles. The secretary was directed to ask the commission to fix a date for a conference with representatives of the companies before the final issue of the order.

Mr. Searle, as chairman of the committee on calorimetry, reported progress. It is expected that a valuable report on this subject will be made next year.

Mr. H. W. Peck, Rochester, chairman of the committee on arrangements, reported that, in view of the success with which the district meetings held during the year had met, similar gatherings would be held during the coming season. The committee has decided upon the following months, meeting places and subjects : November, Syracuse, street lighting; January, Buffalo, railroad crossings; February, Poughkeepsie, accounting; March or April, Fulton, new business; May, Ithaca, joint use of poles and suburban distribution; June or July, Rochester, use of auto trucks.

Mr. J. T. Hutchings, general manager Rochester Railway & Light Company, discussed at length the possibilities for public-utility companies contained in the new Stanley electric cooker which is to be placed on the market by the General Electric Company. It was suggested that if the heater could be sold by public-utility companies at a reasonable price, and a fixed rate per month charged for its use in households, the possibilities of making the improvement an important source of revenue were good. At the request of the chairman, Mr. F. C. Bates, of the General Electric Company, also discussed the possibilities of the electric cooker. At the conclusion of the morning session the members went to the Engineers' Club for lunch.

MR. SEARLE ON CIVIC RELATIONS.

Mr. R. M. Searle discussed the question of the extent to which public-service companies should enter into civic relations. He described in detail the activities of the Rochester Railway & Light Company in these matters. Fourteen officials of the company are members of the Chamber of Commerce, and a number are represented on various committees of that body. The company has three members in the Rochester Ad Club and twenty in the Rochester Engineering Society. At the time of two annual meetings of national organizations at Rochester this summer, the Grand Army of the Republic and the Shriners, the company was represented on committees of arrangement. The company is also represented on the Water-Power Race Commission and has several members in the various social and country clubs of the city. The costs of all these memberships are met by the company. At each social, political and business gathering the company is represented by someone in authority. The representative has full authority to speak for the company on any subject that may be brought up, if he tells the truth. The men have authority to go to Albany and represent the company before committees or commissions, with full authority so long as they tell the truth. A subordinate who

may go has the same authority as if his superior officer had gone in his stead. One man representing the company attends all fairs, club picnics, civic luncheons, etc.

The policy which led to the attitude of the company in these respects has developed from meetings held every Friday, at which forty or fifty men are present, and every subject of importance to the company is discussed in order that all may be well posted concerning general affairs. A representative of the company attends labor gatherings and other similar meetings. If the company is attacked at any meeting that takes place, the representative of the company who is present makes a clean, frank statement of the position of the company. Mr. Searle added that, while so much had been done in this direction, the real question was, "Can the company afford not to do more of it?" but that the general officials, who had full knowledge of the art, should not hamper the operations of the company by failing to have others in its employ just as well qualified to discuss its affairs. The theory of the Friday meetings is that a complete and critical view of the affairs of the company will be presented for the consideration of those who attend. The meetings give a breadth of view that is a great advantage to every man. They train men to be prepared to stand on their feet and discuss questions and give information regarding the affairs of the company that could not be acquired in any other way. It was particularly gratifying that there had never been a single opportunity for criticism of the men for their action at public gatherings.

One instance showing the advantage of prompt action was mentioned by Mr. Searle. He attended a hearing before the State Water Supply Commission, at which an attorney made an attack on the company. During the hearing Mr. Searle asked to be sworn and told the lawyer that he was ready to be cross-examined under oath regarding the statements that had been made affecting the Rochester company. The result of the hearing was that the position of the company was made plain and the attack was answered as soon as it was made public. If the question of recognizing the attack had had to be referred to the directors, a good deal of delay would have occurred before the position of the company could have been set right in the minds of the public.

Employees who are given authority to speak for the company in this way have to have the same feeling toward the board of directors and superior officials that they would have toward a father. The company does not believe in holding toward its men an attitude which in effect says, "Why didn't you say this or that?" The theory is that procrastination would easily cost the company one hundred times more than any possible errors of judgment. The officials and employees who have authority in these matters understand that they are to do something and that they will be supported by their superiors. With this feeling developed as it is a man goes out with courage to do business, get a contract or defend the company, and all who have anything to say tell the same story all the time.

Mr. Searle suggested the disappointed feeling of men who would fear that censorious criticism would be visited on them for what they did. The criticism at the Friday meetings is of a constructive nature. A man who goes out to do business for the company knows that when a thing is right to do he has authority to do it. If a meeting to consider the affairs of a charitable institution is held, a representative of the company is present, and he knows that he has authority to donate a gas stove, if it appears to be right. He does not have to refer the question to a superior officer or to the board of directors. If an executive, Mr. Searle said, tries to shoulder too much responsibility it leads to trouble. Other officials ought to be thoroughly competent and to know ten times as much of the details of their work as executive officials. All they need is enthusiasm. If they go to the executive with a proposition and he agrees with them, they go ahead and make a success of it. If he says "No," the men get discouraged and in time stop making suggestions.

If the men are not competent to decide what is right, the company should get men who can decide questions themselves. The theory is that if an assistant is competent to do the work in case of the death of his superior, he is competent to represent the company at any time. The attitude of the company in these matters extends through all the officials and subordinates, and even to the office boy, who has authority to go into offices and remind officials that callers are waiting to see them. Continuing, Mr. Searle said that no policy of this character could succeed unless the executive officials had the manliness to stand by subordinates who might make honest errors of judgment. He said that five daily newspaper representatives see officials of the company every day. Any man has authority to talk to the reporters if he tells the truth. The reporters find a good deal of news in what the company does when the officials themselves would not realize that they had anything worth publishing. It is a physical impossibility for the executives to do all the work. The real work of management of the company is done by subordinates.

After Mr. Searle finished his talk it was voted that the remarks be printed for distribution to the members of the association.

In subsequent discussions on general subjects attention was called to the recent decision of the United States Circuit Court regarding the value of the Des Moines (Ia.) water system.

The election of officers resulted as follows: President, Mr. R. M. Searle, Rochester; first vice-president, Mr. C. G. M. Thomas, Flushing; second vice-president, Mr. J. C. De Long, Syracuse; treasurer, Mr. Stuart Wilder, Westchester Lighting Company; secretary, Mr. C. H. B. Chapin, New York.

Convention of the Electric Vehicle Association of America.

The second annual convention of the Electric Vehicle Association of America was held Oct. 10 in the Engineering Societies Building, New York City. There were three sessions—morning, afternoon and evening—in addition to a short business session which preceded the work of the convention proper at which routine work, including proposed changes in by-laws, was disposed of. On the recommendation of the nominating committee the prsent officers were proposed for re-election in order that the program mapped out by them last year might be carried out to fruition. Mr. E. S. Mansfield on behalf of numerous electrical interests in Boston extended an invitation to the association to hold its next annual meeting in Boston during the electrical show in that city, which will open in the Mechanics' Building Sept. 28, 1912.

PRESIDENT'S ADDRESS.

The meeting was opened by the delivery of the presidential address by Mr. W. H. Blood, Jr. In one year, he said, the association has succeeded in enrolling a membership of 200, and it was pointed out that the National Electric Light Association was nearly ten years in securing an equal membership. In this country there is invested, he said, $10,000,000 in electric trucks, and $30,000,000 in electric pleasure vehicles, and nearly one-third of these amounts has been spent within the last twelve months. Mr. Blood suggested that the activity of the Electric Vehicle Association of America might have something to do with the recent great increase. The prospective purchaser of a commercial electric car no longer asks "Will it work?" He knows that it will, and now simply wishes to ascertain what it costs to move a ton a mile, and how

many days in the year a truck can be depended upon. On the other hand, the electric vehicle salesman has now little difficulty in proving to the satisfaction of a prospective purchaser that the cost per ton mile for handling merchandise within city limits is lower when the electric truck is used than when any other means are employed, and that the electric truck is a far more reliable piece of apparatus than the gasoline truck. It was pointed out that during the hot wave last July 3752 horses died of exhaustion in the four cities of New York, Chicago, Philadelphia and Boston alone, representing a property loss of about $1,000,000.

Mr. Blood said that the activity of the makers of gasoline cars who have taken up the manufacture of commercial trucks during the past year or two has been phenomenal, and that sales of cars of this type have simply emphasized the almost universal tendency toward mechanically operated trucks. The gasoline and the electric truck are not, in a general sense, competitors; each has its own field, and the field of the electric is fast widening. Moreover, while the price of gasoline (through deterioration of quality) is steadily rising, the price of electricity is constantly going down, which condition has a significance that no business man can fail to appreciate.

Referring to the field for mechanically operated vehicles Mr. Blood said that over the streets of Boston alone 25,000 tons of freight are handled, on the average, every day in the year, and that the total freight handled by wagons throughout the country is certainly more than ten times as great as that handled by all of the railroads put together. A rough estimate of the number of power wagons necessary to do the trucking in this country which can be advantageously handled by electric power indicates that nearly 3,000,000 of such wagons would be required. Mr. Blood called upon the central stations of the country to see that not gasoline but kw-hours are used for this work, and asked vehicle manufacturers to place in the hands of the public electric vehicles capable of properly accomplishing the service required of them, to supply storage battery manufacturers and requested rugged and efficient batteries which may be used by any one.

The work of the various committees of the association was appreciatively mentioned, particularly that of the committee on standardization and of the committee on rates and charging stations. A national publicity campaign has been prepared and funds for carrying it on are now being gathered. The hope was expressed that national advertising will be supplanted by consistent and continuous local advertising, both on the part of vehicle manufacturers and the central stations. The usefulness of the association, Mr. Blood said, had been demonstrated beyond a doubt, and every one connected with the electrical industry should be enrolled upon its list of members. A provision of the constitution makes it easy to form branch organizations in centers of local activity, and the hope was expressed that during the coming year a number of these, similar to the New England branch now doing most successful work in the city of Boston, will be formed. The committee on education has arranged to establish in trade schools and as part of the Y. M. C. A. courses regular courses of instruction and exhibits, which will familiarize the young men of the country with the simplicity and efficiency of the electric vehicle, its motor and its battery.

On motion of Mr. Hayden Eames it was decided to print the president's address and to distribute it broadcast to all interested in the electric vehicle.

COMMITTEE REPORTS.

After the reading of the president's address and at other times during the day various standing committees presented their reports. The standardization committee exhibited a charging plug constructed to pass 100 amp continuously and to have an overload capacity of 150 amp. Voltages equivalent to thirty and forty-two lead cells were already standardized and the committee suggested a get-together meeting, when the matter of speeds, loading space, one-motor versus two-motor equipment and guaranteed mileage could be threshed out. The insurance committee reported the results obtained from 5000 blanks soliciting statistics on vehicles and expressed the hope of soon effecting a preferential rate for pleasure and commercial electric vehicles. The transportation committee suggested that a representative of the association join with a committee of the National Association of Automobile Manufacturers and endeavor to have the classification committee of the railroads make a distinction between gasoline and electric cars in freight rates. The membership committee reported a total of 197 members acted on, with twelve more to follow, and with thirty-two applications from one firm. Of the seventy-three active members of the association, twelve are vehicle manufacturers, forty-eight are central-station companies, three are publishers and ten are manufacturers of accessories. There are five auxiliary members and 119 associate members at the present time. The membership is distributed as follows: One hundred and forty-seven on the Atlantic Coast, thirty-two in the Middle States and eighteen west of the Mississippi River. The committee on garages reported on conditions in the garage on Atlantic Avenue, Boston; the committee on papers commented on the lack of data available to members through papers and the committee on rates for charging stations had a printed report, but copies were not received up to the close of the convention. The report in substance was given by Mr. Mansfield and showed that in the matter of rates central stations certainly made concessions to the electric vehicle. The committees on contests and on the establishment of courses of training in electric-vehicle practice reported progress.

VEHICLE COMMERCIAL PROBLEMS.

The first paper presented was prepared by Messrs. R. L. Lloyd and John Meyer, of the Philadelphia Electric Company, and was entitled "Electric-Vehicle Commercial Problems." Among the commercial problems to be solved by the central station in attempting to promote the use of electric vehicles the authors laid particular stress upon the value of salesmanship. Attention was called to the good results obtained from proper salesmanship in problems relating to the substitution of electric motors for steam engines, etc. The representative attempting to promote the use of electric vehicles should study the stable practices, the facilities for loading at the store, routing, the load to be carried, and in addition thereto the disadvantages of the present system as compared with the advantages of the proposed system. While the industry is in its infancy the central stations should be willing to do many things of this nature for the promotion of the cause, but the time will come when the central-station managers will rebel against furnishing all the brains and labor necessary to take care of electric vehicles. Co-operation with electric-vehicle company salesmen is the goal to be reached by central stations. These salesmen should be made familiar with the policy of the central station in the territory in which they operate and should be advised in regard to rates, etc., so as to permit of their making statements that will be confirmed by the central station. The central station should not be expected to contribute to a national advertising campaign, for this is peculiarly the function of the vehicle manufacturer. However, the central station can co-operate by means of local advertising and intelligent salesmanship, and the result should be of mutual benefit to the user, the vehicle manufacturer and the central station. The voltage of vehicle batteries should be so selected that they can be charged conveniently from central-station mains, of which the normal emf is usually between 105 volts and 115 volts. An attempt should not be made to alter the system to suit the battery, but the battery should be made to suit existing systems. One of the first requisites for the

introduction of the electric vehicle in any city is the establishment of a properly equipped garage. During the period of introduction, before there exists a demand for charging service, it is difficult to induce private parties to establish electric-vehicle garages and vehicle salesmen therefore look to the central station for the inauguration of charging facilities. After this branch of its business becomes a money-making proposition it could well be turned over to other parties with whom the central station could then co-operate.

Discussion.

The paper was discussed by Messrs. J. C. Bartlett and E. R. Whitney, of Philadelphia; W. H. Blood, Jr., and E. S. Mansfield, of Boston; A. Churchward, of Lynn, and G. W. Lunn, of Chicago. Mr. Bartlett discussed the paper from the viewpoint of the garage man, Mr. Whitney from the viewpoint of the manufacturer and the others from the central-station standpoint. Mr. Bartlett claimed that a technical man lacked enthusiasm and was a failure as a salesman. He emphasized the advantages of a trouble man and stated that the majority of troubles were due to undercharging, dragging brakes and to the commutator of the motor. Garages charging a flat rate of from $30 to $35 a month for charging, washing, cleaning and delivering an electric vehicle were failures according to the speaker, who also claimed that the garage should have a profit of about 4 cents per kw-hour on the energy sold. He said that unless the garage was subsidized by the central-station company it could not be made profitable. The bulk of his argument was directed against the central stations.

Mr. Whitney also called attention to some of the shortcomings of some distribution systems where, because of lack of copper, it was necessary to connect a battery across a 220-volt circuit and waste about half of the energy in a rheostat. High rates for energy, he claimed, affect the sale of electric vehicles, the buyer usually looking at the cost of energy as the cost of operating the vehicle.

Mr. Mansfield maintained that the central station should join in the plan for national advertising, as what will help the electric-vehicle industry will help the central station. He voiced the lack of enthusiasm apparent and said the entire industry needed some ginger to quicken it. Where enthusiasm existed there was no trouble in disposing of electric vehicles and no vexed questions needing settlement. Mr. Lunn said that in Chicago, where two trouble men are employed, experience shows that they do not go over the same defects twice after having once pointed out the remedy to the user.

ACCOUNTING SYSTEM FOR ELECTRIC TRUCKS.

The second paper at the morning session was written on the above subject by Mr. E. W. Curtis, Jr., of New York City, who described a system of accounting for electric trucks which involved the use of forms for keeping records, in order that results obtained by users in one part of the country could be compared with the results obtained in another part. The records were divided into three distinct items—maintenance, operation and performance—and methods for determining under which heading each item of expense should be placed were described in detail. The author claimed that in the application of any system designed to obtain operating records time is one of the most important elements, and incidentally it is the most flexible. For this reason a time stamp and time clock should be used in conjunction with the forms in order to insure the greatest accuracy in this direction, and accuracy can be further improved by the use of clock-recording instruments on the trucks.

Discussion

Messrs. L. A. Coleman, of the United Electric Light & Power Company, New York, and A. L. Holmes, of the New York Edison Company, both discussed the paper and commented on some of the forms given therein. Mr. Coleman claimed that there was too much complication and bookkeeping involved to make the suggested system of use, especially in the hands of a driver. Both the speakers explained the forms used by their respective companies.

GARAGE ILLUMINATION.

The author of this paper, Mr. J. G. Henninger, of Cleveland, discussed in general the lighting of large and small garages and referred briefly to the principles underlying the proper illumination of a garage by day and by night. He emphasized the point that there should be plenty of outlets conveniently located, no matter how large or how small the garage may be. In a small garage, just large enough to house one machine and a charging set, there should be at least two lamps, one located on the ceiling and arranged so as to light the entire building interior, and a second portable lamp to be fitted to a long cord for both inspection and bench work. For convenience there should also be a lamp in front of the building, controlled from both the house and garage. In larger garages the general illumination should be such that a portable lamp would not be necessary, except for the inspection of the interior of a car, or for close work such as adjusting the brushes on a motor or making some close adjustments on a gasoline engine. Numerous outlets for portable lamps should be arranged about the building for the latter purposes. Plans of typical garages with wiring diagrams formed part of the paper, which was illustrated by stereopticon.

Discussion.

Mr. C. A. Littlefield, of the New York Edison Company, in discussing the paper called attention to the fact that in very many cities the presence of numerous outlets, even if not used, would result in a higher cost for energy owing to the systems of charging in vogue. He also commented on the paper from the viewpoint of the illuminating engineer.

EFFECT OF LOW TEMPERATURE ON THE ALKALINE STORAGE BATTERY.

Mr. Walter E. Holland, of Orange, N. J., presented a paper in which attention was called to an extensive series of low-temperature tests made upon the Edison alkaline storage battery by the Electrical Testing Laboratories, at the suggestion of Mr. Edison, in order that users of this battery might have full knowledge of its weak points, as well as of its advantages, and thus be able to handle it intelligently and avoid trouble. The tests showed that there is a critical temperature for the electrolyte, which varies with the rate of discharge, below which the capacity falls to a low value, and the lower the rate of discharge the lower is this critical temperature. It was found, however, that as soon as the battery was warmed to a temperature above the critical value the full capacity of the battery was obtained in every case. It was evident, therefore, that the chemical action which takes place in the battery is retarded below certain critical temperatures. In service it is necessary to prevent the electrolyte temperature from falling below the critical values. With a battery box well closed up a wagon taken out of a garage in which the temperature has been kept at 65 deg. can stand idle in the street at a temperature of about 7 deg., with a light breeze blowing, for a period of four hours before the electrolyte drops in temperature to 55 deg., below which the vehicle might become stalled if a large current were required. Mr. Holland claimed that the few cases where trouble was experienced with pleasure vehicles were invariably in cold localities, the conditions usually being that the battery was charged about once a week in a public garage and in the meantime was kept in an unheated shed, being used only for very short runs. In such cases as this heating units should be installed inside the battery compartment, to be operated by

the battery during the idleness of the vehicle. As soon as the battery is put in use in propelling a vehicle it will warm itself. The alkaline storage battery has been at a great disadvantage because of vehicle practice standardized by the older lead battery. Unsuitable motors, low-rate charging apparatus and ventilated battery compartments have been the principal hindrances, but these are gradually being overcome by progressive manufacturers.

Discussion.

Messrs. E. Higgins, representing the manufacturers of the Detroit electric vehicle, and F. E. Queeney, of Gimbel Brothers' New York garage, both testified to the excellent service received from the Edison battery in winter when proper precautions were taken to cut off the air supply and inclose the battery in an easily removable cover. The first speaker said that out of the 4000 cells in use by his company in New England no serious trouble was noted due to loss of capacity owing to cold weather. In New York the trouble was trifling.

VEHICLE-BATTERY PRACTICE IN CENTRAL STATIONS.

A paper on this subject was read by Mr. S. C. Harris, of the battery department of the New York Edison Company. The author showed to what extent standardization of equipment would prove of advantage to central stations. He stated that a determined effort should be made to secure standard methods, both in the construction and in the operation of vehicle batteries. Differences in the design of battery compartments cause an unnecessary amount of confusion and waste of time in the charging of batteries. In some cases half an hour or more is required to make a change of batteries, which, if more conveniently arranged, could be changed in not over ten minutes. The battery compartment should be arranged so that all of the cells are easily accessible for inspection, cleaning and watering. The battery itself should be standardized, so far as construction is concerned. There are in use at the present time many different styles of straps, any one of which would prove satisfactory. Many different makes of rubber jars are employed, while it would be preferable to select any one for standardization. In the operation of the vehicle batteries by the central-station garages there is a lack of uniformity in method. Some of the stations make use of curve-drawing instruments, others employ indicating voltmeters, some use ammeters, some watt-hour meters and others use amp-hour meters with automatic circuit-breakers. The amp-hour meter is being extensively employed for ascertaining the condition of the battery while in service in the vehicle. However, this meter does not indicate the condition of the battery, but indicates only the amount of charge or discharge, and it may mislead a switchboard attendant into believing that the battery is fully charged, when in reality considerable more charge is necessary. When used by inexperienced persons the readings of the meter may prove misleading under extraordinary conditions of charging. When a battery has been overdischarged it is best to disregard the meter for subsequent charges, as well as for regular overcharges. The author called attention to the fact that differences of over 100 per cent in the life-miles of batteries during practically the same kind of service are now found to exist. The cause may be improper operation or it may be poor plate manufacture, but whatever the cause may be combined effort should be made to locate it and find a remedy therefor.

Discussion.

The paper was discussed by Messrs. Bruce Ford and C. Blizard, of Philadelphia; W. Yeager, of Brooklyn; H. Alexander, P. D. Wagoner and F. E. Queeney, of New York, and G. W. Lunn, of Chicago. Mr. Ford said that from the paper one might infer that there are any number of proper methods of charging and told of the various means of telling when to stop a charge. He also spoke of the advantages of the amp-hour meter in vehicle practice. Mr. Blizard said that if vehicle manufacturers could determine on one, two or three sizes of battery it would be an easy matter to standardize. Mr. Wagoner expressed the same opinion. Mr. Yeager spoke on better standards, higher development of battery equipment and the proper operation and care of vehicles. Mr. Lunn claimed that the amp-hour was necessary on commercial cars.

Mr. Alexander, who is consulting engineer for a number of department stores in New York, said his experience indicated that the less a driver concerns himself with amp-hour meters the better the service. Drivers are not intelligent when instruments are considered and all that could be expected is that he would give the vehicle the same attention that he would give a horse, leaving to the garage the rest of the care. He said that in delivery service the electric vehicle can only use about one-third of its capacity. If it delivered 200 packages a day it did a good day's work and that amounted to about 20 miles. Notwithstanding this, however, it compared favorably with the horse-drawn vehicle. He said battery renewals were a large drawback and suggested a battery that would have sort of a "smashing point"—that is, it could be returned to the maker or would wear out when it needed cleaning. If the battery could be cheapened so that cleaning became unnecessary it would be an advantage. The care of the battery was expensive, Mr. Alexander said, and its upkeep should be given over to an inspection department maintained by manufacturers.

THE BATTERY TRUCK CRANE.

A paper on this subject was prepared by Mr. R. H. Rogers, of Schenectady, N. Y., and describes a machine designed by the General Electric Company which is a combination of hoist, crane and vehicle. The latter is a 1-ton storage-battery truck, made very short and having the battery mounted on the top of the frame at the rear end over the traction wheels, where it acts as a counterweight for the crane. The wheels are smaller than normal and have a greater speed reduction to the drive wheels, in order to insure a high draw-bar pull. The springs under the front end are of double strength to bear the overhung weights liable to be handled by the crane. The battery, motor and controller are of standard type. A crane arranged to swing at 180 deg. is mounted on the extreme front of the vehicle, and is supported near the upper end by a pivoted "A" frame and guy rods and at the bottom by a large ball and socket joint. The crane is equipped with rope and chain slings, barrel tongs, bale grapples, box hooks, snatch blocks and small tools. The hoist is a compact, weather-proof motor, controller, gears and truck in one unit, capable of lifting one ton 20 ft. per minute. It handles 30 ft. of cable and receives its energy from the vehicle battery. The hoist is bolted to the vehicle frame at the foot of the crane, and the cable passes up through the hollow top pivot over the sheaves and ending in a swivel hook. When loads of a half ton or less are handled the pulley is removed and the swivel hook is used directly. The hoist-controller handle is connected to a lever convenient to the operator, who pulls to raise, pushes to lower and releases to stop at any point, the lever returning to the central or off position automatically. The hoist contains, beside the automatic holding brake, a load brake, which prevents excessive speeds when lowering. The machine is applicable for hoisting, hoisting and carrying on the hook and for towing trailers. The manner of using it for these operations was explained at length by the author.

Discussion.

The paper was discussed by Messrs. T. I. Jones, of Brooklyn; R. M. Lloyd, of Long Island City, and H. M. Harding, of New York.

THE ELECTRIC VEHICLE IN SMALLER CITIES.

The fact that electric vehicles have not been generally introduced in the smaller cities was attributed in a paper by Mr. F. H. Golding to three causes. First, the central station does not appreciate the value of vehicle charging as a source of revenue. Second, the central-station operator feels that because of some peculiar local condition, such as grades, paving or character of community, the introduction of electric vehicles into his city cannot be successfully accomplished. Third, a desultory hit-or-miss campaign has resulted in a few vehicles, but failure to instruct vehicle purchasers properly and to oversee operation has caused vehicles to fail to give satisfaction to the users. In order to show what can be accomplished in the way of introducing electric vehicles in the medium-size city the results obtained at Rockford, Ill., were outlined. There are now in use in this city, which has a population of about 45,400, 185 electric pleasure vehicles and eighty private charging equipments. The success of electrically driven vehicles in this city is due in a large measure to the fact that the electric company employed a capable battery and motor man for the purpose of instructing owners in the care and operation of the vehicles and batteries. It is estimated that the annual cost of operation of an electric vehicle in Rockford is about as follows: Energy for charging, $60; battery maintenance, $30; tire maintenance, $40; vehicle maintenance, $50, the total being $180.

Discussion.

Mr. Golding's paper, which was read in his absence by Mr. J. A. Hunnewell, of Lowell, Mass., brought forth more discussion than any other paper read before the meeting. Some of the discussion was relevant and some irrelevant to the subject matter in hand. Mr. Hunnewell told what is being done at present by his company in displacing horse-drawn vehicles and securing data which he hoped would be of service to his company in approaching prospective users of electrics. Mr. H. T. Sands, of the Tenney organization, objected to the assertion that the central station does not appreciate the value of the electric-vehicle load, maintaining that the large majority do appreciate it and only desired to know how to get at it. He cited an instance to illustrate how backward garages are to take up the matter of electric vehicles. His company in one of the New England cities offered to install a charging set, agreed to keep it in repair, instruct garage men how to use it and then give the garage owner 20 per cent of the profit, but none would accept the proposition, and his company had to open a garage itself.

Mr. Alexander cited instances where central stations afforded no facilities for charging, and also said the cost of rectifiers was too high and the life of the tube too short, although the rectifier was remarkably efficient in operation. As compared with an electric machine his records show that the gasoline machine is out of service twice as much as the electric, and the repairs cost four times as much. Mr. Bartlett also mentioned some instances where the central station offered no inducement to electric-vehicle users. Mr. Thompson, of the Public Service Electric Company, gave testimony as to the value of having an engineer as a salesman, stating that in Newark they had an engineer and his sales averaged two a week. Mr. Russell, of the General Electric Company, stated that the life of rectifier tubes averaged 1000 hours.

The difficulties encountered in small cities by department stores were evidenced by Mr. Queeney, who related the troubles of his company in getting garage service in Long Branch and in Far Rockaway. In order to show that the vehicle manufacturers are themselves backward in pushing their wares Mr. Thompson, of the Public Service Electric Company, stated that his company offered to expend $3,000 in publicity work if the manufacturer would spend $300, and found no one to accept the offer. Mr. Sands stated that in one instance eight inquiries were forwarded to manufacturers, and in 80 per cent of the cases no demonstration could be obtained. Mr. T. I. Jones said there were a dozen live prospects in Brooklyn at the present time and no attempt is made by the manufacturer to effect a sale. One concern desires twenty-five 5-ton trucks at the rate of three a month, but only one manufacturer up to the present is willing to make a demonstration to secure the order. Of nine charging stations maintained by the Brooklyn Edison company not more than two earn $1.50 a month, and the largest earns but $14 a month. Messrs. Hayden Eames, Day Baker, C. D. Marsh, F. J. Stone and others also joined in the discussion.

IMPEDIMENTS TO THE GENERAL INTRODUCTION OF POWER WAGONS.

At the evening session Mr. Hayden Eames, of Cleveland, gave a paper on the above subject. Among the impediments to the general introduction of the motor vehicle the author claimed that the psychological difficulties are by far the greatest. It will be necessary not only to educate owners and prospective users of such vehicles, but education must be directed also towards employees, who in most cases must modify their point of view and methods before the introduction of motor vehicles can be expected to be general. The principal economical virtue of the motor vehicle lies in its labor-saving characteristic. Under almost all conditions the wages of the drivers form the largest single item of expense. If the work of the man operating the new machine is arbitrarily limited to only what he can do with the old nothing is gained. In all regular delivery systems the problem is not only to lay out routes to fit the new machine, but to select the machine sizes so that the largest possible machine that can be fully loaded will completely empty itself over a selected route during a day's work. When motor vehicles are substituted for horse-drawn vehicles the method of loading and unloading, of handling packages, shipping-room arrangements and routine must be altered in order to take advantage of the new facilities. An investigation of the work accomplished by horse-drawn vehicles used by different express companies in New York City showed that teams were idle 40 per cent of the total time. A considerable portion of this idleness was due to the fact that the horses needed rest, and the men adjusted their loading periods with this end in view. The motor vehicle requires no rest, and hence the loading time can be considerably decreased. However, it is difficult to persuade the average user that the idle periods in a day's work in any way affect a comparison of the draft animal and the motor vehicle. The author concluded that the whole question of the rapid introduction of the motor vehicle is to-day one of public education. No associations, no corporations nor individuals are in a better position to provide this education than are the central stations, and no one, except possibly team users, are more likely to reap so great ultimate profit.

Discussion.

Mr. C. E. Michel, St. Louis, explained the difficulties encountered in introducing electric trucks, by reason not only of the inertia relating to the established use of horses, but also on account of the active competition of the gasoline car. The electric-car salesman finds himself handicapped on account of the fact that the gasoline-car salesman offers to the prospective customer an article which is well advertised and concerning the merits of which the prospective customer is already fairly well acquainted, while the customer is ignorant of the electric truck offered to him. Mr. Michel suggested that the National Electric Light Association, the Association of Edison Illuminating Companies and the Electrical Vehicle Association of America form a joint committee for the purpose of compiling data relating to the cost of operating gas, electric

and horse-drawn vehicles. With such data at hand the salesman of electric trucks would be in a much better position to introduce electric vehicles for supplanting horse-drawn vehicles or in competition with the gasoline vehicles.

Mr. P. D. Wagoner remarked that the keynote of the whole situation relating to the introduction of electric vehicles is education. The prospective users must be properly instructed concerning the possibilities of decreasing the time consumption in loading, the advantages of motor vehicles over horse-drawn vehicles and the specific advantages of electric over gasoline trucks.

Mr. Arthur Williams claimed that the arguments presented in Mr. Eames's paper are of such convincing nature that the paper should be placed in the hands of all owners of horse-drawn vehicles in New York. He pointed to the advantageous features of properly worded advertising matter, and claimed that the most effective form of advertising is that which calls attention to "repeat orders." Instead of pointing out the defects in other electric vehicles a salesman should lay stress on the excellence of the vehicle he is attempting to sell, and no more effective argument can be offered than that relating to "repeat orders."

Mr. W. P. Kennedy remarked that not all owners of electric vehicles appreciate the advantage of training the drivers in the operation of vehicles before placing them in sole charge. To this fact can be attributed many of the apparent failures of electric vehicles to perform the duty which should reasonably be expected. Mr. Kennedy remarked that the fact that certain department-store owners who have had in service for a number of years many electric vehicles continue to use horse-drawn vehicles is not due to the fact that the electric vehicles are unable to show a considerable saving over the horse-drawn vehicles. In one particular case where the electric vehicles were known to be operated at one-third less cost the department-store owner claimed that the investment necessary for substituting additional electric vehicles for horse-drawn vehicles could be more advantageously invested in the department store, in which the profit was even greater than the one-third saving by the substitution of one type of vehicle for the other.

CENTRAL STATION BACK OF ELECTRIC VEHICLE.

Mr. E. S. Mansfield, of Boston, gave an illustrated talk on the indorsement of the electric vehicle by central stations. The paper was devoted to a detailed discussion of the campaign of education for the introduction of the electric vehicle in which the Edison Electric Illuminating Company of Boston is now engaged. This campaign has been outlined in our columns in earlier issues. The author stated that it is not to be expected that every central station will institute a vehicle campaign on the same scale as that in Boston, but a proportionate amount of well-directed energy in this direction will bring about results beneficial to the electrical interests and increase the revenue to the central station. No electric company is so small that it cannot make use of some form of electric vehicle, and the electric interests are the logical ones to take the first step. If one or more agents can be induced to enter the field it is better for the central station not to undertake to sell electric vehicles, but if this condition cannot be brought about the local company is justified in taking the agency for what it considers the best make of electric vehicles until private interests are willing to assume the responsibility of representation, at which time the central station should relinquish its agency and continue its work along the line of co-operation. At least one first-class electric garage and charging station should exist in every city or town served by an electric-lighting company. It is better that such a charging station should be under private management, but, in any event, charging facilities should be provided, and the central station should undertake to do this work if efforts fail in other directions.

Discussion.

President Blood remarked that no one can now claim that the central station is not doing its part to hasten the introduction of the electric vehicle.

Mr. W. H. Francis, of the Edison Electric Illuminating Company of Boston, being called upon by President Blood, described a trip made by him from Boston to New York in a Bailey electric roadster during the present week. The cars are of a new type designed for business as distinguished from pleasure and touring service. They are built with a low body mounted with a three-point suspension, giving maximum flexibility to the front axle and corresponding smoothness in riding. During the 244-mile run partial or complete battery charges were obtained during the lunch hour or evening at Worcester, Springfield, New Haven and Stamford. The following data were noted during the trip:

	Miles	Hours	Miles per Hour.	Amp. Hours per Mile.
Boston to Worcester	45	2.15	20.0	2.70
Worcester to Springfield	53	2.30	21.2	2.55
Springfield to New Haven	64	3.12	20.0	2.77
New Haven to Stamford	43	2.0	21.5	2.58
Stamford to New York	39	2.15	17.3	2.23
Totals	244	12.12	20.0	

Each car is equipped with sixty Edison cells, the maximum charging emf of which is 1.85 volts per cell, and the mean running emf of which is 1.2 volts per cell. The car carried two passengers.

THE MOVING OF CITY FREIGHT WITH ELECTRICITY.

Mr. William P. Kennedy presented data, in the nature of a progress report, relating to the moving of city freight with electricity, a subject which had recently been assigned to him for investigation. He stated that considerable difficulty had been encountered in compiling the necessary data for a complete report, hence he was unable to submit a formal report at the present time. His investigation showed that no complete record is kept of horse-drawn vehicles in New York City, other than those kept for public hire. There are in use only 1260 trucks coming under this head. It would seem, therefore, that the horse-drawn vehicles not being registered are not required to pay taxes in the city of New York. In the city of Chicago a larger proportion of trucks are held for public hire, 90,000 horse-drawn trucks being registered. During 1910 13,000,000 tons of freight entered the port of New York and about 12,000,000 tons were sent out. About 7,500,000 tons were handled in coastwise trade at the New York piers. Mr. Kennedy estimated that the handling of this frieght by horse-drawn vehicles costs on an average 38 cents per ton, while the cost would be only about 15 cents per ton if handled by electric vehicles.

ELECTION OF OFFICERS.

As mentioned in the first part of this account, the nominating committee recommended the re-election of the present officers, which was done as a matter of form in the manner prescribed by the constitution. The officers elected are as follows: Mr. W. H. Blood, Jr., president; Mr. Arthur Williams, vice-president; Mr. C. E. Firestone, secretary; and Mr. Harvey Robinson, 245 West Forty-second Street, New York, treasurer and assistant secretary. The board of directors of the association is as follows: Messrs. H. H. Rice, Frank W. Smith, P. D. Wagoner, Louis Burr, W. P. Kennedy, Frank L. Dyer, James T. Hutchings, Louis A. Ferguson, W. W. Freeman, F. M. Tait, Hayden Eames and Charles Blizard.

Annual Meeting of the American Electric Railway Association.

The most successfully conducted convention in the history of the American Electric Railway Association or its predecessors was held during the present week at Atlantic City, N. J. The convention was the thirtieth annual gathering and it was attended by representatives of about 475 electric railway companies. Meetings were held by the parent association and by the allied Accountants', Engineering, Claim Agents' and Transportation and Traffic Associations. The affiliated Manufacturers' Association made the finest exhibit that has ever been presented for the inspection of delegates to the convention. Exhibits were made by 225 companies.

Abstracts of some of the reports presented before the Engineering Association are given herewith.

COMMITTEE ON GENERATION.

To facilitate investigation and report subjects discussed by this committee, which made its report to the Engineering Association on Oct. 11, were assigned to sub-committees of one, whose reports are included, as follows:

Mr. H. G. Stott: "Investigation of economical increase in boiler capacity for service and peak conditions"; "forced draft"; "possible improvements in apparatus or methods for increasing the boiler-room operating economies."

Mr. R. A. Dyer: "Direct-current turbo-generators larger than 500 kw."

Mr. L. P. Crecelius: "The purchase of bituminous coal under heat-unit specifications"; "the best standard voltage and frequency to be adopted for three-phase turbo-alternators, with reference to size as related to voltage."

The chairman, Mr. Crecelius, took up the matter of a report on "boiler settings" with Dr. D. S. Jacobus, who consented to prepare a report but was delayed so that it was impossible to include it in time for publication.

In addition to the members of the committee named the following are members of the committee: Messrs. W. E. Rolston, William Von Phul, B. F. Wood, A. R. Myers, C. L. Gates and A. Wolff.

In his paper on developments in the generation of steam Mr. Stott said that several important steps have been taken in producing new measuring instruments for use in the boiler-room and in a more complete recognition of the fact that the boiler and furnace of the future must be able to conform more closely to the load curve than in the past. While the standard method of boiler testing gives an accurate average result, it does not give any idea of what the boiler is doing for short intervals of time. Two distinct types of indicating apparatus are now available; first, the Venturi meter, which is used preferably to measure the water fed to the individual boiler. The second method is the use of a steam flow-meter of the Pitot tube type. A third measuring instrument of almost equal importance, but for measuring the amount of coal fed to each boiler, has also been developed. In the furnace the principal development seems to be in the intelligent use of forced draft in order to obtain high rates of combustion when required. To meet the enormous variation of load in railway plants in an economical manner, taking into consideration not only operating and maintenance charges, but also fixer charges, the best solution seems to be to design the boiler-room equipment for maximum operating economy at the average load of the plant and be prepared to sacrifice some slight loss in efficiency at the higher and lower loads. Several methods of doing this are available, the most obvious one being to install two stokers or grates under each boiler so that one may be banked during the lighter loads. A second method, which is as yet incompletely developed, is the use of oil in burners protected by the bridge wall from the grate or stoker on which coal is being burned. A third method is the use of some form of grate or stoker which can be operated economically with natural draft up to say 150 per cent of rating, with best economy at 100 per cent rating.

Mr. Crecelius, in his paper on the best standard voltage and frequency to be adopted for three-phase turbo-alternators with reference to size as related to voltage, submitted figures indicating that 11,000 volts is the most satisfactory standard transmission emf for most systems requiring large steam turbo-alternators. Considerations of simplicity and economy demand that the voltage of the generators be the same if possible. The proper protection can be secured best by connecting the necessary current-limiting reactors mounted on non-magnetic cores between the generator and bus, and the reactors should have a reactance of approximately 6 per cent. The use of a three-phase, star-connected, 11,000-volt, 25-cycle generating system with grounded neutral seems particularly advantageous for conditions existing in the average American city of over 200,000 inhabitants where the energy is generated by means of steam turbines, and it is a debatable question whether this does not constitute one of the principal limitations to large turbo-generators.

Mr. Dyer in his report on direct-current turbo-generators larger than 500-kw rating quoted a comprehensive letter of the Westinghouse Electric & Manufacturing Company. This company has constructed a number of 500-kw, 1500-r.p.m. units. It has not built any 600-volt railway sets of greater rating or entertained any serious requests for bids. From information taken from the technical press, however, it is stated that units up to 750 kw or 800 kw at a voltage of 250 kw up to 1500 kw at 600 volts have been built by several different European electrical concerns. The average speeds of such size units are in the neighborhood of 1500 r.p.m. and 1200 r.p.m. respectively. The small number of such sized machines in operation and the experience of the manufacturers in this country seem to indicate that the demand for such machines is not great.

Mr. Crecelius in his paper on the purchase of bituminous coal under heat-unit specifications gave a list of reports prepared by the United States Geological Survey and the Bureau of Mines. He also gave the text of the contracts used by the Interborough Rapid Transit Company, of New York, and the Cleveland Railway. Throughout the reports the government has been exceedingly careful to advise against the use of specifications purely on a heat-unit basis. It recommends that a careful examination of plant conditions be made and a fuel supply be selected in accordance with the conditions revealed. The most careful attention should be given to the nature of the existing furnace equipment, draft and load; the character of coal best suited to the plant conditions; the number of heat units obtainable for a unit price; the cost of handling the coal and ash; and the possibilities of burning the coal without smoke or other objectionable features. In general it is stated that in any market the coal obtainable at the lowest price is the most economical provided the furnace equipment is suitable. If the furnace is not so designed as to permit the use of the cheaper coal it should be changed.

REPORT OF COMMITTEE ON POWER DISTRIBUTION.

The report on power distribution was presented before the Engineering Association on Oct. 9 by the following committee: Messrs. A. F. Hovey, chairman; G. W. Palmer, vice-chairman; S. L. Foster, A. S. Richey, E. J. Dunne, S. D. Sprong, William Roberts, C. R. Harte and J. J. Brennan (resigned).

Specifications for overhead crossings and electric transmission lines framed by this committee in conjunction with committees of the National Electric Light Association, the American Railway Engineering Association and the American Institute of Electrical Engineers are published as an appendix to the report. The specifications have been adopted by the Association of Railway Telegraph Superintendents.

A sub-committee on line-material standardization was appointed with a view to making as many as possible of the units of construction interchangeable, but it was unable to make a report, and this matter will go over until next year.

Outline drafts of specifications for the joint use of poles, specifications for overhead crossings of trolley-contact wires over railway tracks and specifications for overhead crossings of foreign wires with electric-railway wires have been prepared and tentatively adopted by the committee. Through the 1912 committee the association should get in touch with various other associations and prepare a joint report on this subject.

The committee reported on the following matters in addition to those mentioned: Specifications for high-tension, three-conductor, paper-insulated, lead-covered cables; specifications for single-conductor, paper-insulated, lead-covered cable for 1200 volts; specifications for 30 per cent Para rubber compound; recommendation for standard-grooved trolley wire in sizes other than No. 0000; a paper on concrete, latticed and tubular poles; definitions of cable and strand; specifications for No. 00 round hard-drawn copper trolley wire.

The report of the committee on energy distribution was discussed by Messrs. A. F. Hovey, E. N. Lake, G. W. Palmer, William Roberts, R. D. Coombs, L. P. Crecelius, Harry Barker, Farley Osgood and H. H. Adams.

REPORT OF COMMITTEE ON EDUCATION OF ENGINEERING APPRENTICES.

The report of the committee on education of engineering apprentices was presented before the Engineering Association on Oct. 9. This report was prepared by Messrs. Walter H. Evans, chairman; W. G. Gove and H. A. Benedict. It was considered advisable at this time to confine investigation to that class of engineering apprentices that will be employed in the maintenance of electric-railway equipment in the rolling-stock department. The observations of the committee led to the conclusion that, taking the country over, there has never been a time when a greater necessity existed for the proper training of young American boys in mechanical trades than is presented now. The committee submitted a schedule as a recommended course of training to develop a thorough electric-car mechanic. The total time of apprenticeship actually served would be forty-eight months. Seventeen years of age is the best time to start.

REPORT OF COMMITTEE ON HEAVY ELECTRIC TRACTION.

The committee on heavy electric traction confined its report, made to the Engineering Association, to the following subjects: Location and clearances for third-rail working conductors; location of electrical end conductors on cars and locomotives, and location of automatic train stops.

As a result of conferences with committees of the American Railway Association and the American Railway Engineering Association a diagram has been prepared showing location and clearance lines for third-rail working conductors, which it is understood will be satisfactory to the committees of those associations. It has been thought advisable to confine attention at this time to the establishment of such standard location and clearance lines as affect the relation of the third-rail construction to rolling equipment and leave for subsequent consideration such standard location and clearance lines as affect the relation of the third-rail to permanent-way structures. It is recommended, however, that the incoming committee take up the question of permanent-way construction lines as bearing upon the space required for the installation of third-rail working conductors, with the object of recommending a standard satisfactory to the committees of the three associations. The committee therefore recommends standards and also terms which have been adopted by the American Railway Engineering Association.

The subject of the location of electrical end connections on cars was considered by a sub-committee. It is important for all roads, in the opinion of the committee, to adopt as far as possible the Master Car Builders' standards for location of mechanical and hose connections, but in view of the wide variation in practice regarding electrical connections it will probably be impossible, at least for a considerable time, to adopt a definite standard for each type of connection. It would seem feasible, however, to define certain space at the ends of cars to be used in electric service either at once or at some furture time.

As the use of automatic train stops actuated in connection with the signal system as a means of protection against failure to see or obey the signal is increasing, especially on electric railways operating in subways and tunnels, the committee makes certain suggestions regarding the proper location of trip arms along the track and contact devices on cars, which may be regarded as "recommended practice" until such time as the use of train stops becomes sufficiently general to justify the adoption of a standard location.

The members of the committee are Messrs. E. R. Hill, chairman; E. B. Katté, vice-chairman; W. S. Murray, J. H. Davis, Hugh Hazelton and E. F. Gould.

REPORT OF COMMITTEE ON EQUIPMENT.

The committee on equipment, of which Mr. M. V. Ayres was chairman, submitted a report dealing with the heating and ventilation of cars, design of car bodies for light weight, design of car trucks for light weight, design of electrical equipment of cars for light weight, standard couplers and air signals and control connections for interurban service. Concerning the changes that could be made with advantage in order to lighten the electrical equipment of cars, the committee stated that motors could be redesigned with special reference to the elimination of unnecessary material, use could be made of higher speed motors with greater ratio of gear reduction, forced ventilation could be employed, the working temperature could be raised by the use of heat-resisting insulation and the speed could be increased by field-circuit control.

The weight could be minimized by the use of sheet metal gear cases, which becomes possible by the substitution of autogenous welding for riveting. The use of forced ventilation has been regarded for years as a probable development of electric car equipment. There is no doubt that it affords means for greatly increasing the steady load-carrying capacity of motors. With modern motors of interpole construction there will hardly be any circumstances under which the heating will not be the practical limit of rating, and forced ventilation affords an effective means of increasing the rating.

The plan of raising the working temperature by the use of heat-resisting insulation has been tried in several instances with very encouraging results. The possibility of operating at higher temperatures, which has been brought about by the introduction of interpole design, means greater output from a given motor or a lighter motor for a given output. Asbestos and mica have been used with some success as heat-resisting insulating materials, but the most encouraging results have been attained by the impregnation of armature and field coils with the bakelite compound, which upon being baked becomes hard and dense like amber, and of great heat-resisting powers. Bakelite is prepared in two forms, one a fluid resembling shellac, and the other a thick paste. The former is used for painting and impregnating coils, and the latter for filling in interstices. There seems to be good reason for believing that the treatment of armature and field coils with this substance will prove very valuable, both as a means of reducing the size of motors for a given duty and as a method of prolonging the life of motors already in service.

When the interpole type of motor is employed the field

weakening method of increasing the speed can be utilized to advantage. The control apparatus is arranged so as to provide one extra notch for high-speed running. When run on this notch part of the turns of the field winding are cut out of circuit, thus weakening the field and increasing the speed.

Of the methods outlined above for reducing motor weights none is inconsistent with any of the others, and it would by no means be impossible to combine all of them in one motor. There seems, therefore, to be good reason to expect that the near future will see marked improvements in the electrical equipment of cars, resulting both in an increase in efficiency and a reduction in weight.

REPORT OF COMMITTEE ON WAY MATTERS.

The committee on way matters, of which Mr. J. M. Larned was chairman, submitted a report covering girder and standard T-rail sections, with a view to recommending standards, including also an investigation for suitable mechanical joints for these sections; organization and rules for the proper government of the way department; shop facilities and working equipment for the way department, and the cause of nosing of cars and its effect on unequal wear of gauge line of track. The committee recommended that increased attention be given to the discussion of the question of the use of preservative methods for timber used for track construction. It also recommended that all companies consider the adoption of suitable apparatus for grinding the heads of rails at the joints, which apparatus is also valuable for removing corrugations in the heads of rails, where such defects exist.

REPORT OF THE JOINT COMMITTEE ON BLOCK SIGNALS FOR ELECTRIC RAILWAYS.

The report of the committee on block signals for electric railways, of which Mr. J. W. Waldron was chairman, contained brief descriptions of the various signaling systems now in service throughout the United States, and a digest of laws and rulings concerning the installation of block signals on electric railways. On account of the rapid development taking place in new apparatus and methods of signaling the committee did not feel justified in reporting any definite conclusions. However, it suggested certain work for the 1912 committee. This work would relate to signaling on single-track and double-track interurban railways operating under various headways and at various speeds.

REPORT OF THE COMMITTEE ON STANDARDS.

The committee on standards, of which Mr. Paul Winsor was chairman, considered certain matters referred to it from the 1910 committee on equipment and the 1910 committee on way matters. It suggested the standardization of the taper for pinions. The time was not considered ripe for the adoption of certain other matters as "standard," and the committee recommended instead that they be adopted as "recommended practice" rather than as "standard." Under the head of recommended practice were discussed rolled steel wheels, gauge for mounting wheels, open-hearth steel wheels, gauge of track on curves, layout of track switches, mates and frogs and symbols for recording surveys.

REPORT OF COMMITTEE ON BUILDINGS AND STRUCTURES.

The committee on buildings and structures, of which Mr. Martin Schreiber was chairman, submitted reports relating to economical maintenance, proper facilities for employees and proper installation of fire protection of carhouses and terminals, including open yards. It recommended that for the report of 1912 consideration should be given to standard general specifications and form of contract for railway structures, review of standard carhouse construction, with recommendations and proper waiting rooms and shelters for electric railways.

REPORT OF COMMITTEE ON RULES OF PROCEDURE OF THE COMMITTEE ON STANDARDS.

The committee on rules of procedure of the committee on standards, of which Mr. Paul Winsor was chairman, submitted seventeen rules covering procedure in the adoption of standards up to the time of their submission to letter ballot. It was recommended that the standing committees of the association make all necessary investigations and definite recommendations regarding proposed standards, and that the functions of the committee on standards be confined to reviewing such recommendations before they are presented to the association in convention for discussion and reference to letter ballot.

Toronto Meeting of the American Electrochemical Society.

Following are abstracts of papers read at the meeting of the American Electrochemical Society not noted in our issue of Sept. 30:

TRANSFORMATION OF AMORPHOUS CARBON INTO GRAPHITE.

A paper by Mr. C. W. Arsem, of the Research Laboratory of the General Electric Company, gives a review of the various opinions at present held concerning the conditions under which the different forms of amorphous carbon are transformed into graphite, together with the results of an experimental investigation of the two following points: First, whether heating alone to a high temperature transforms a pure form of carbon into graphite and, second, if this is not the case, whether it is possible to cause this transformation to occur by heating the carbon, well mixed with a quantity of mineral matter, insufficient to form carbides with all the carbon present. This latter point is suggested by Dr. Acheson's hypothesis that the formation of carbides plays an important rôle in the transformation of carbon into graphite.

Graphite is defined as that allotropic form of carbon having a specific gravity of 2.25 to 2.26.

The results of the investigation show that all the pure forms of carbon which have been tested when fired above 3000 deg. reach a limiting density which is not appreciably raised by the addition of small amounts of mineral matter. The end product is graphite in some cases and not in others. Pure petroleum coke, heated without addition of mineral matter, is converted into graphite of excellent quality, while lampblack, although it increases in density, does not reach the value corresponding to graphite, nor acquire any of its other physical properties, even when heated with various oxides.

TUNGSTEN OR MOLYBDENUM WIRE RESISTORS FOR ELECTRIC LABORATORY FURNACES.

A paper by Messrs. R. Winne and C. Dantsizen, of the Research Laboratory of the General Electric Company, of Schenectady, N. Y., described two types of electric laboratory furnaces in which ductile tungsten or molybdenum in wire or ribbon form is used as the heating element. On account of their hight melting points and relatively low cost tungsten and molybdenum are well adapted for such purposes.

The one type of furnace described is a crucible furnace, the other type a tube furnace. The heating cylinder in which the crucible is placed in the first type and the tube in the second type are made of alundum. In the first type a wire of ductile tungsten or molybdenum is wound in a helical groove on the outer surface of the alundum cylinder. In the second type molybdenum ribbon is wound around the alundum tube. In both furnaces an atmosphere of hydrogen is maintained. They can be used at temperatures of 1700 deg. C. and 1600 deg. C. respectively.

The paper was discussed by Messrs. Northrup, Hering, Kohn and Saunders.

RESISTIVITY OF SODIUM AND POTASSIUM.

A paper by Dr. Edwin F. Northrup gave new data on some electrical properties of sodium, potassium and their alloy in the temperature range from 0 deg. C. to 200 deg. C. Whenever these metals, or their alloy, pass through the melting point there is a very abrupt change in the resistivity (an increase in resistivity by 52 per cent for potassium).

Potassium has a high temperature coefficient of resistance (0.0058) in the range from 20 deg. C. to 80 deg. C. The temperature coefficient of the alloy of potassium and sodium, instead of being approximately the mean of the coefficients of sodium and potassium when liquid, is only between a third and a fourth of the mean value of the coefficients of its constituents in the same temperature range.

The ratio of the resistivity at 20 deg. C. of sodium to copper is 3.058, but the density of copper is almost exactly nine times that of sodium, which, in round numbers, makes sodium three times as good a conductor per unit of weight as copper. Hence it could compete with copper as a conveyor of electric energy if it cost anything less than three times as much as copper per pound, provided, of course, energy-carrying capacity were the only consideration. It has been suggested before now that sodium might be used in iron pipes in a practical way for carrying electric energy.

Dr. Northrup suggests that, inasmuch as electrochemical processes often necessitate the carrying over short distances of enormous currents, the consideration of the proposal might be with advantage taken up afresh.

ELECTRIC RESISTIVITY OF IRON ALLOYS.

A paper by Prof. Charles F. Burgess and Mr. James Aston gave an account of measurements of the electric resistivity of a long series of iron alloys made up from electrolytic iron. As the chief result it appears that all three of the elements of arsenic, silicon and tin, which are beneficial to the magnetic properties of iron, have the desirable accompaniment of high electrical resistivity. Among the materials adapted for high-resistivity resistors various combinations of iron with nickel, chromium and silicon are most suitable.

The change of resistance due to heat treatment in general follows the changes of physical hardness due to the treatment. Annealing usually results in a decrease of resistance. Quenching is uncertain in its effect; usually there is an increase of resistance with physical hardening of the bar.

REPORTS.

At the conclusion of the Thursday afternoon meeting Mr. FitzGerald presented the report of the special committee which had been appointed to consider methods for raising the standard, if possible, of the papers published in the *Transactions*. This report had been approved the night before at the meeting of the board of directors.

Mr. Edward R. Taylor presented a set of recommendations which will be presented at the coming National Conservation Congress.

ELECTROCHEMISTRY IN CANADA.

The first paper of the Friday session was presented by Dr. S. Dushman on electrochemical and electrometallurgical developments in Canada. He first reviewed briefly the existing electrochemical plants, including the manufacture of calcium carbide, calcium cyanamide, ferrosilicon, aluminum and phosphorus, electrolytic lead refining at Trail and electrolytic parting of gold and silver in the Ottawa Mint.

The second part of the paper discussed the possibilities of further developments, dealing in detail with the mineral resources of Canada, the available water-powers and transportation facilities.

METALLIC CERIUM.

A long paper by Dr. Alcan Hirsch gave an account of a very extended investigation, carried out at the University of Wisconsin, on the preparation and properties of metallic cerium. As starting materials use was made of the unpurified rare-earth residues from monazite sand obtained as a by-product in the incandescent gas-mantle industry.

The author describes in detail the preparation of anhydrous cerium chloride and anhydrous fluoride and then deals with the preparation of metallic cerium. Aluminothermic methods do not give the pure metal, but this may be obtained by electrolysis of the chloride. The difficulties which were to be overcome in this electrolysis are discussed in great detail and detailed instructions given for the procedure.

The paper was discussed by Dr. Whitney, Dr. Parsons, Dr. Northrup, Dr. Richards, Dr. Brown and Mr. Hansen.

THERMAL CONDUCTION AND CONVECTION IN GASES.

A paper by Dr. Irving Langmuir gave an account of an experimental investigation of thermal conduction and convection in gases at extremely high temperatures.

The first experiments were made with a glowing Nernst filament in air. Later, however, in order to extend the range of temperature, experiments were made with a ductile tungsten filament in a hydrogen atmosphere. Figures are given on the power consumption of the filament as a function of the temperature.

MEASUREMENT OF SMALL GAS PRESSURES.

A paper by Dr. C. F. Hale dealt with the measurement of very small gas pressures by a method in which the indications are not dependent upon the use of mercury.

The manometer of Pirani depends on the fact that at low pressures the heat conductivity of gases is a function of the pressure. He connects to the system under test an ordinary tantalum lamp, the filament being heated by current at a constant voltage. As the gas pressure in the system is decreased more and more the heat lost by conduction through the gas is continually decreased, consequently the temperature of the filament mounts steadily and with the temperature the resistance of the wire increases, thereby cutting down the current. One has only to calibrate ammeter readings against the indications of some form of manometer.

ELECTROCHEMISTRY IN NORWAY.

Dr. Joseph W. Richards, who had just returned from abroad, then gave a concise description of some of the Norwegian electrochemical and electrometallurgical works which he visited this summer. They included an aluminum plant operated by the Héroult process, a nickel refinery (separating of copper and nickel by the Hybinette process), a plant of the Badische Company for making sodium nitrate from atmospheric air by the Schoenherr process, an aluminum plant of the British Aluminum Company, a metallic sodium plant, the large carbide and adjoining cyanamide works at Odda and an electric zinc plant, using the modified electric zinc furnace of De Laval, and an electric steel plant. Reduction of iron ore to pig iron in the electric furnace is not yet carried out in Norway, but will be started next year. There are also the large Notodden works for making nitrates from air by the Birkeland-Eyde process.

Electric energy can be bought in Norway from power companies at $6.50 per hp-year, while the cost of generating energy is stated to be between $4 and $5 per hp-year.

ZINC PLATING ON WIRE.

The last paper of the meeting, by Mr. Alfred Sang, dealt with his process of galvanizing steel wire by heating it electrically in zinc oxide or zinc dust. The best temperature is 550 deg. C. About 154 kw-hours of electrical energy is required per long ton of wire of any diameter. The theory of the process, as well as of the sherardizing process, is discussed at some length; his process is considered to be a special case of hot galvanizing.

After a vote of thanks to all who had contributed to the genuine success of the convention the meeting adjourned.

New York Electrical Show.

The Electrical Exposition of 1911 opened in the new Grand Central Palace, Lexington Avenue, New York, on Oct. 11 and will remain open to the public until Oct. 21. The affair was formally launched into being at a luncheon given by the New York Edison Company in the afternoon at which members of the Electric Vehicle Association of America and persons well known in the electrical industry, including Messrs. T. A. Edison, N. Tesla, G. Dunn, and J. Gilchrist, were present. Mr. J. W. Lieb, Jr., acted as toastmaster and advantage was taken of the occasion by the producers and consumers of copper to present to Mr. Edison 1 cu. ft. of electrolytically refined copper suitably engraved and mounted on an ebony pedestal. The presentation speech was made by Mr. C. W. H. Kirchhoff, president of the American Institute of Mining Engineers, and the gift was accepted on behalf of Mr. Edison by Mr. F. L. Dyer. Addresses were also delivered by Mr. G. B. Cortelyou and Mr. C. W. Price. There were about 200 guests present.

View of the Electrical Show at New Grand Central Palace.

The first, second and third floors of the New Grand Central Palace are given over to the show, the third floor having a track for automobiles and being set aside exclusively for automobile uses. The building does not serve to set off the exposition as did Madison Square Garden in previous years although it has greater floor area. Immense columns and pillars are everywhere apparent and from no place can one obtain a comprehensive view. That sense of splendor and dazzling brilliance which impressed the visitor entering Madison Square Garden at previous electrical shows is not obtained in the present exhibition. The exhibits themselves are of much more popular interest than was the case at previous shows and the management has striven to bring out prominently the application of electricity to the trades. There are arranged on the second floor of the building a number of industries in miniature in all of which electricity is now used extensively. The United States Government has also a number of very interesting exhibits. These include the electric school and commissary department of the navy; a spectacular exhibit from the coast defense division of the army, in which a battleship is blown up by submarine mines; a signal corps exhibit; a display of old electric inventions from the National Museum; a layout from the Department of Agriculture and a collection from the Bureau of Standards.

A number of electric automobile manufacturers have exhibits of their newest cars on the ground floor and opportunity is afforded for demonstrating the cars on the track on the third floor. The usual array of apparatus made by manufacturers of motors, meters, switches, vacuum cleaners, cooking and heating appliances, glassware, fixtures, vibrators, therapeutic machines, etc., is in evidence.

The New York Edison Company, The United Electric Light & Power Company, The Edison Electric Illuminating Company, of Brooklyn, and the New York & Queens Electric Light & Power Company have spaces allotted them. The New York Edison Company has a display of charts, diagrams, models and photographs demonstrating methods

of handling business. There is also a reception room at one end of the hall, while on the opposite end are an illuminating engineering display, a printing establishment in operation, a window lighting display and a collection of photographs. In another part of the building the company has in operation an electric dining-room and a model kitchen.

The New York & Queens Electric Light & Power Company has arranged its booth for reception purposes where its customers are entertained. The company operates in the borough of Queens and this is the first time it has taken space at the electrical show.

The United Electric Light & Power Company has the choicest location in the show, its booth being in the center of the exhibition and towering above all others. The feature of its exhibit is a portrayal of modern store lighting and a practical demonstration of appliances used in business. The double-deck booth is so divided and so arranged that each store has its individuality and independent treatment and equipment. A barber shop, grocery store, clothing store and electric supply store are shown. Each store has had careful attention directed to

Exhibit of the New York Edison Company.

its illumination, the object being to show the proper method of applying electricity to store lighting and other practical purposes. The upper part of the booth is used as a tea and reception room. Musical and vocal entertainment are provided for guests as well as a light collation. Electric cooking appliances are employed in connection with the latter.

The Edison Electric Illuminating Company of Brooklyn has returned to its first love in that it has arranged an exhibit of a strikingly artistic and attractive home. The model apartment shown some years ago by the same company proved the most attractive drawing card of the exposition at that time and the present exhibit has already demonstrated its worth for gathering people to it. The home is divided into a kitchen and laundry, dining-room, bedroom, parlor, reception room and entrance hall and porch, each room being as complete and as clearly a model of what it should be as time, pains and money can make it. The many electrical devices which have been developed and introduced in recent years to add to the health, comfort and convenience of the household are shown in actual service.

Public Service Commission News.

MASSACHUSETTS COMMISSION.

The first of a series of hearings on the use of demand indicators by electric-lighting companies was held by the Massachusetts Gas and Electric Light Commissioners Oct. 6. The immediate occasion for the hearing was a recent legislative resolve, which called upon the commission "to investigate the operation of demand indicators, so called, and to determine whether or not it is expedient to regulate or prohibit the use of such meters." The board is required to report to the next Legislature by Jan. 15, 1912. Several consumers appeared before the board and complained that the indicators used by the Edison Electric Illuminating Company of Boston are inaccurate and the system used to compute bills is unfair. Demand indicators are used in office buildings and in industrial plants and indicate the demand at certain times. Representative Callahan, who drafted the bill that led to the legislation, said that the case before the commission is based on the contention that the indicators, while intended as measuring devices, do not accurately measure the current. The indicator, he contended, should be tested by the sealer of weights and measures. At present, however, there is no public inspection. He said it was unfair that the consumers should be rated on the basis of the cost of a plant large enough to furnish the maximum demand, because all maximum demands do not occur simultaneously.

Everett W. Burdett, Esq., counsel for the Massachusetts Electric Lighting Association, stated that if there is a public demand for a change of system the companies interested would like to know it, but at present the principle underlying the use of the demand indicator is considered sound. There should, of course, be assurance that indicators are accurate, and the Gas Board is the proper tribunal to deal with that phase of the subject. Engineer Carpenter, representing both sides at interest, favored the use of the indicator. A second hearing on the subject will be held by the commission Oct. 27, when the lighting companies' position in the matter will be given.

NEW YORK COMMISSION.

As the result of a hearing held by the Public Service Commission, Second District, last week, on the application of the Amsterdam Edison Electric Light & Power Company for authority to exercise franchises for the construction of poles, etc., and distribution of electricity for light and power in the village of Akin and the towns of Amsterdam, Mohawk and Florida, Montgomery County, Commissioner Sague, who conducted the hearing, announced that he would recommend that the requested permission be granted to the company. Congressman Theron Akin, of Akin, asked several questions of Attorney Charles D. Nisbet, who appeared for the applicant. No company is at present supplying electricity to the localities which the applicant company intends to enter.

The Public Service Commission for the Second District has authorized the Ft. Plain Gas & Electric Light, Heat and Power Company to lease to the Mohawk Hydro-Electric Company its plant in the village of Nelliston until May, 1921, with the option of renewal for a period of ten years thereafter. The Mohawk Hydro-Electric Company is authorized to exercise a franchise granted by the village of Nelliston on Dec. 20, 1910, to furnish electricity for light, heat and power in that village. The company is also authorized to exercise franchises granted by the town boards of Ephratah and Palatine to build electric transmission lines in these towns. The company is authorized to issue its first mortgage thirty-year 6 per cent bonds to the amount par value of $56,000 to provide funds for the building of the transmission line and the equipment necessary to operate under the franchises mentioned. The bonds are to be sold at not less than 92.

WISCONSIN COMMISSION.

The commission has given its decision in the matter of the joint application of the LaCrosse Gas & Electric Company and the La Crosse Water Power Company to the effect that the commission act as arbitrator in interpreting the meaning of certain provisions in a contract between the applicants. The applicants are parties to a contract, according to the terms of which the water-power company is required to furnish electric energy to the gas and electric company at the rate of 1 cent per kw-hour and in case of failure to furnish such energy is to pay the "actual station operating expenses" of operating the latter's steam plants. The contract further provides that, as a penalty for interrupted service, the water-power company shall pay the expenses of operation of the gas and electric company's steam plants when it is necessary to run these plants because of interrupted service and shall receive no remuneration whatever until an amount of energy equal to 200,000 kw-hours shall have been generated; for amounts in excess of this the water-power company is to pay only the difference between the actual station operating expenses and the 1-cent rate provided in the contract. When it becomes necessary to operate the steam plants because of the lack of hydroelectric power the water-power company is required to pay the gas and electric company at the rate of $500 per month as rental, this figure representing the interest at 6 per cent on the plant investment.

The question in debate was whether the item "maintenance, supplies and expenses," as charged by the gas company in the expense account, was properly included in the term "actual station operating expenses." An examination of the accounts showed that the matter of repairs constituted the major portion of the above item. The proceedings at the hearing indicated that the views of the respective parties were diametrically opposite on the subject presented for arbitration. The water-power company contended that the term "actual" was used to make sure that only actual station operating costs, such as labor, fuel, oil and waste, would be charged. On the other hand the interpretation given by the gas and electric company was that in case of failure to furnish energy as required in the contract the water-power company was to pay such expenses—exclusive of the penalty provision—of the gas and electric company in the generation of energy, that the cost of energy to the latter would be the same as it would have been had the former company performed its part of the contract. This interpretation would include all items under the head of operating expenses—repairs, depreciation, etc. The exact wording of the clause in controversy was not found in any of the authorities investigated by the commission, but from the facts presented at the hearing, the authorities consulted and partially cited in the case and all circumstances having a bearing upon the matter the commission was of the opinion that the term "actual station operating costs" as used in the contract properly includes the cost of repairs to the power plant of the LaCrosse Gas & Electric Company during the periods of its operation necessitated by the failure of the water-power company to furnish the agreed amount of energy.

OHIO COMMISSION NEWS.

At a hearing of the application of the Mount Sterling and the Bell telephone companies to connect their lines before the Ohio Public Service Commission last week. Mr. R. H. Schryver, secretary of the local company, testified that it had a ninety-nine-year contract with the United States Telephone Company by which it was to have the exclusive right to all the long-distance business passing through the exchange, but that the United States Telephone Company had agreed to allow the Bell wires to be installed as competitors. Testimony was adduced to show that the same conditions exist with relation to the Van Wert Telephone Company, where the Bell lines are also seeking admission to the exchange. Those opposed to this move argue that the Bell and United States companies are both owned by the same financial interests and that they have merely been waiting the passage of legislation that would allow them to consolidate.

City Solicitor Newton D. Baker has informed Mayor Baehr that it is not incumbent upon him or anyone to place specific instances of poor telephone service before the Public Service Commission in order to have an investigation made, but that under the new law the commission may investigate upon any form of complaint or may do so without any complaint and upon its own initiative. Mayor Baehr, however, says that there are plenty of instances of inadequacy, and data is now being secured and will be presented to the commission at an early date.

Attorneys for the Columbus Gas Company, Columbus, have intimated that they may test the constitutionality of the new public utilities law on the ground that it implies the taking of property without due process of law. An appeal for a lower rate for gas had been filed with the commission and at the hearing the attorneys declared that the law makes no provision for notifying gas companies in cases such as this, where they may sustain a loss of income through a possible reduction of rate. The legality of the petition filed with the commission was also questioned.

MARYLAND COMMISSION NEWS.

The Maryland Public Service Commission handed down a decision requiring the Western Union Telegraph Company to re-establish a branch office in the Belvedere Hotel, the terms of the lease to be approved by the commission.

There is a probability that a special investigation of the telephone service of Baltimore will be instigated by a committee of the Merchants' & Manufacturers' Association. The utilities committee of the association met last week to discuss the report of the experts who came here from Boston to investigate telephone conditions at the request of the Public Service Commission. There are many local business men who are not pleased with the report of the Boston experts and are in favor of having a committee of their own conduct an investigation.

CURRENT NEWS AND NOTES.

COMMONWEALTH EDISON N. E. L. A. BRANCH.—The membership of the Commonwealth Edison Company's branch of the National Electric Light Association is now 1274, or about one-sixth of the total Class D membership of the association. The annual banquet of the Chicago Section will be held the night of Nov. 1.

* * *

JOVIAN ANNUAL CONVENTION.—Mr. J. V. Dostal, national Jupiter of the Sons of Jove, has announced the general program of the Sons of Jove convention on Oct. 17-19 in Denver. This will include a smoker on Tuesday evening, Oct. 17; a business session Wednesday morning; a Jovian torchlight parade and special illumination Wednesday night; a second business session Thursday morning, and the national rejuvenation and banquet on Thursday evening, Oct. 19. The rejuvenation will be staged far more elaborately than at any previous convention, new apparel, apparatus and "business" being provided to add to the solemnity of the occasion. The banquet at the Brown Palace will follow Denver precedents in previous joviations. A sharp contest between Pittsburgh and Philadelphia for next year's convention is promised.

* * *

NEW ENGLAND SECTION I. E. S. OFFICERS.—As a result of a recent letter ballot the following have been declared

elected officers of the New England Section of the Illuminating Engineering Society: Prof. H. C. Clifford, chairman; Mr. H. C. Jones, secretary; Messrs. J. S. Codman and W. S. Farrow, managers.

* * *

Examination for Assistant Electrical Engineer.—The New York State Civil Service Commission, Albany, N. Y., will hold an examination for the position of assistant electrical engineer. The salary is $600 to $900 per annum, with maintenance. Applications must be filed on or before Nov. 3.

* * *

A. I. E. E. Standardization Rules.—The revised standardization rules of the American Institute of Electrical Engineers, which were approved under date of June 27, 1911, have been issued in bound form with blank pages interleaved. The publication is sold in this form for 25 cents, or 15 cents in paper covers.

* * *

Tests of Electric Meters.—Of 6209 tests of customers' meters reported to the New York Public Service Commission, Second District, during August, 1911, 339, or 5.46 per cent, were fast; 4775, or 76.9 per cent, were accurate, and 1095, or 17.64 per cent, were slow. Of a total of 238 companies, thirty-eight did not report for this compilation. Of the companies that made reports 105 made no tests.

* * *

Inventors' Periodical.—On Nov. 1 the publication will be commenced of a monthly journal to be called *The Inventors' Outlook,* having for a purpose to represent the interests of inventors, including the advocacy of laws to protect their rights. The publication will be issued monthly architectural engineering, the remainder being divided among the mining, sanitary and railroad engineering courses.

* * *

University of Illinois Enrolls Three Hundred Electrical Students.—Of the 3620 students enrolled this year at the University of Illinois, Urbana, 1206 are in the engineering schools, of which Dr. W. F. M. Goss is dean. Of these 290 are taking the electrical engineering courses, 275 mechanical engineering, 251 civil engineering and 306 architectural engineering, the remainder being divided among the mining, sanitary and railroad engineering courses.

* * *

Examination for United States Signal Service Electrical Assistant.—The United States Civil Service Commission will hold examinations on Nov. 22 to secure eligibles to fill vacancies as they occur in the position of electrical assistant in the United States Signal Corps, who will receive a salary of $1,080 per annum. Further particulars are given in Circular No. 847, a copy of which may be procured by addressing the commission at Washington, D. C.

* * *

Armour A. I. E. E. Branch.—At the first regular October meeting of the Armour Institute of Technology Branch, A. I. E. E., held in Armour Mission Hall, Thursday evening, Oct. 5, Mr. C. R. Schuler, of the 1912 class, read a paper on "Outdoor Arc Lighting," in which he described the characteristics and applications of the better-known series-type illuminants, including magnetite arc, flaming arc and tungsten incandescent lamps. Mr. L. H. Roller is chairman of the Armour Branch.

* * *

Twin Cities Electrical Show.—The third annual electrical show of the Northwestern Electrical Show Association will be held in the Armory, Minneapolis, on March 16-23, 1912, and already preparations are under way. The Minneapolis Commercial Club has offered prizes for electrical apparatus made by students. Prof. W. T. Ryan, of the University of Minnesota, and Professor Cook and Professor McClintock, of the local high schools, are the committee in charge. The Minnesota Electrical Association will hold its annual convention during the week of the show. Mr. R. W. Clark, 15 South Fifth Street, Minneapolis, the manager of the show, says that the 1912 exhibition bids fair to be a record breaker.

* * *

Electric Irrigation in New Mexico.—Preliminary steps have been taken by the Virtue Mining Company and the farmers of San Simon valley looking to the installation by the former concern of a large hydroelectric plant and the construction of an extensive system of transmission lines through the valley to provide power for operating irrigation pumps upon the farms. The proposed hydroelectric plant will be located in Clear Creek canyon and will utilize a head of several hundred ft. The grade leading up to the falls is about 1000 ft. to the mile, thus providing for future extensions. The San Simon valley is underlaid with a basin of water at a shallow depth and considerable development in the matter of bringing this water to the surface by wells upon which pumps have been installed has already been accomplished. It is planned by the Virtue Mining Company to run a network of electric transmission lines through the valley so that the power may be utilized for operating the irrigation pumps.

* * *

British Columbia Water-Powers.—In connection with the probable ultimate electrification of a portion of its line in the mountains, the Canadian Pacific Railway has acquired a water-power on the Adams River, which flows into South Thompson River near the west end of Shuswap Lake. The Adams River flows out of Adams Lake and is capable of developing 100,000 hp at two different points between the lake and its confluence with the South Thompson. It is in a heavily timbered country, where extensive lumbering operations are now being carried on. During a recent visit to the Okanagan Valley Sir William MacKenzie, president of the Canadian Northern Railway, bought the Coteau water-power and a charter for building an electric railway through the fruit-growing belt on both sides of Okanagan Lake. The Coteau is capable, it is said, of developing 7000 hp, which is sufficient to operate the proposed tram system. If built it will prove a feeder to the steam road which the company proposes to build into the Okanagan from Kamloops.

* * *

Superheating in Steam Turbines.—The current issue of the *Patent Office Gazette* contains the opinion of the Commissioner of Patents in an interference case involving superheating in connection with the steam turbine. There were three parties to the proceedings, namely, Messrs. C. G. Curtis, S. Z. de Ferranti and T. G. E. Lindmark, the dates of the respective United States patent applications being Oct. 2, 1905; Oct. 31, 1903, and Jan. 16, 1903. Mr. Curtis originally relied for conception and reduction to practice on an application filed April 9, 1897, but it was decided that a patent granted April 9, 1899, to Young anticipated Curtis, whereupon the latter abandoned the original application and filed another in 1905. Mr. de Ferranti contended that he should, with respect to priority, be entitled to the benefit of his British application, dated Nov. 11, 1902. The commissioner made a distinction between superheating which causes the steam to have the same temperature when it enters one superheater as that when it enters the next, and superheating in which the temperature is progressively augmented. On the latter ground priority was awarded to Lindmark, which decision was later sustained by the Court of Appeals of the District of Columbia.

DISTRICT ELECTRICAL SERVICE.

Plant of Colorado Springs Light, Heat and Power Company.

Combined Steam and Hydroelectric Generation—Hydraulic Head of 2350 Feet—Data of Tests of High and Low Pressure Steam Turbines—Electric Vehicle Development

One of the most progressive central-station systems in the Rocky Mountain district is that of the Colorado Springs Light, Heat & Power Company, located in the municipalities of Colorado Springs, Colorado City and Manitou and lying at the eastern base of the celebrated Pike's Peak Range, at an altitude of from 6000 ft. to 8000 ft. above sea level. The district served by the company is of primary interest to the tourist and health seeker; but apart from this it has attained a considerable industrial development and illustrates the extent to which electricity may be efficiently applied to the needs of a diversified community having comparatively few manufacturing plants of a miscellaneous character.

The company's system is of particular interest on account of the generating equipment employed, the interconnection of a hydroelectric plant at Manitou and a steam plant at Colorado Springs to secure economical operation, the introduction and sale of electrical energy to large works occupied in the reduction of gold-bearing ores mined in the Cripple Creek district and the popularization of electricity throughout the community as a whole.

CENTRALIZED POLICY.

Within the past few years the company has been carrying forward a centralizing policy in connection with the generation and distribution of its service, which has been of great benefit to the community. Economy of production has resulted from the co-ordination of its steam and hydroelectric plants, and the community has correspondingly gained from the standardization of rates throughout the area reached by the company's lines. Both from the engineering and accounting points of view the service has been improved and an operating organization of high efficiency has been developed. Conspicuous in the company's progress has been the evidence of a close co-operation with the municipal authorities in the direction of street lighting and the illumination of public buildings, the equipment now in service at Manitou and on the exterior of the El Paso County Court House at Colorado Springs illustrating in a marked degree the effectiveness of central-station service in giving a progressive tone to the area supplied.

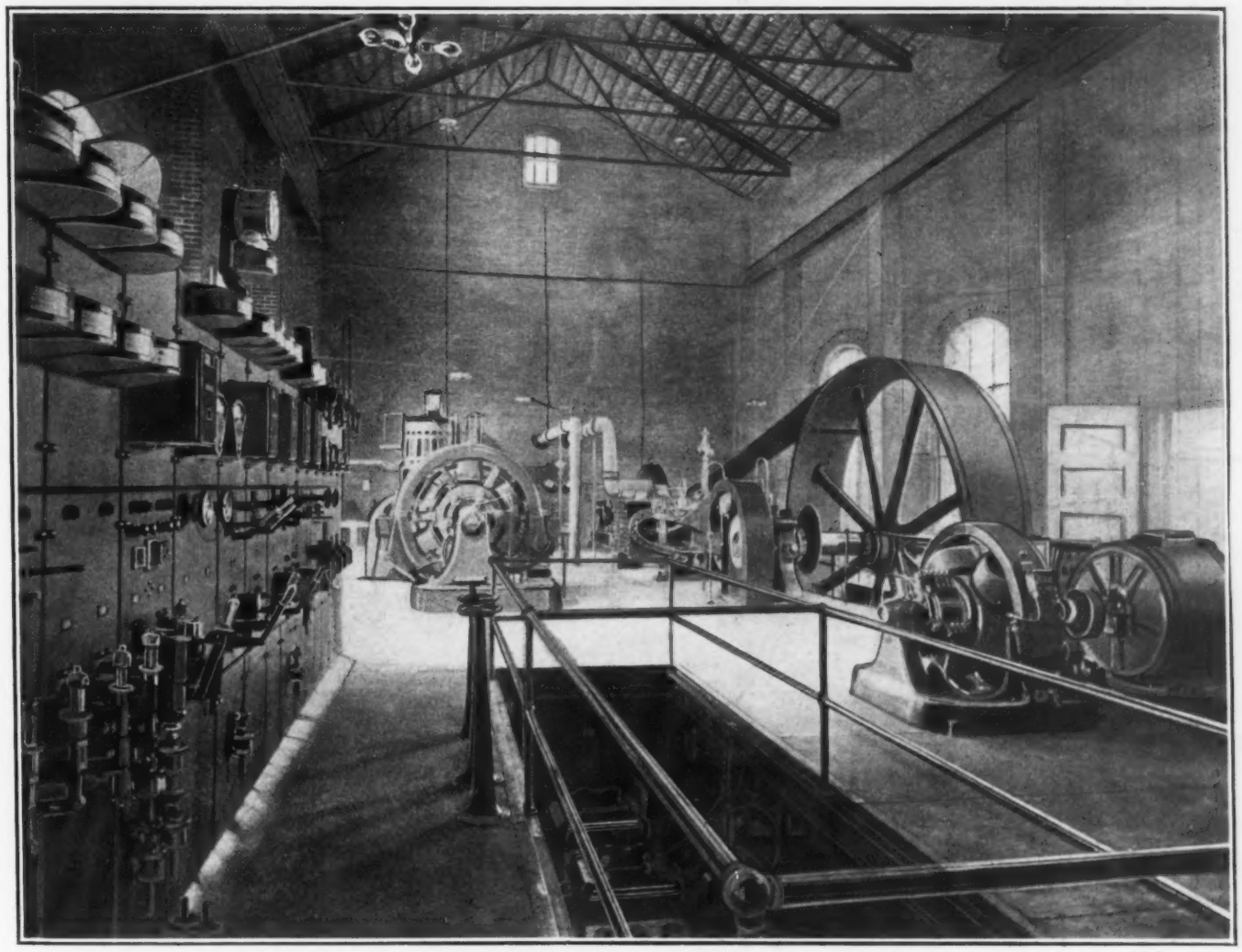


Fig. 1—Interior View of the Colorado Springs Station.

Along commercial lines the company has done much to encourage the introduction of electric pleasure vehicles, signs, window lighting and flatirons, and although the local gas business is conducted by the same management the introduction of electricity has been pushed with more vigor than is found in many cases of purely electric properties.

GENERATING PLANTS.

The generating installations of the company consist of a hydroelectric plant at Manitou, rated at 2250 kw, and a steam-driven station on the northeast side of Colorado Springs, with a rating of about 4750 kw, making a total available normal production of 7000 kw. The steam plant is utilized as the principal point of regulation for the system of interconnected lines resulting from the topography of the company's territory, and the major part of the company's output is distributed from substations located in Colorado Springs and Colorado City, including branch lines tapped off the inter-substation circuits for the supply of some of the larger gold-reduction works utilizing the company's service.

HIGH-HEAD HYDROELECTRIC PLANT.

The hydroelectric station at Manitou is one of the most celebrated plants of its character in the world, the effective operating head being 2350 ft. The station is located in a gorge at the base of Pike's Peak, and derives its water supply from the public reservoirs of the city of Colorado Springs, the latter being located in the Pike's Peak Range at elevations of from 9000 ft. to 14,000 ft. above sea level. Water is delivered to the plant through a steel pipe line about 17,000 ft. long, the pipe being installed in the following sections: Upper line, spiral-riveted, diameter 20 in., length about 4000 ft.; middle line, lap-riveted, diameter 21 in., length about 9200 ft.; and pressure line, double butt-strapped, triple-riveted and bolted flanges, metallic gaskets, diameter 20 in., length about 3800 ft. The hydrostatic pressure on the pipe line at the entrance to the station is about 1020 lb. per square inch, and the company has given unusual attention to the hydraulic problems involved in the installation, which was owned by the Pike's Peak Hydroelectric Company prior to the recent purchase of that property by the Light, Heat & Power Company.

The Manitou plant contains three 750-kw, 6600-volt, three-phase, 60-cycle General Electric revolving-field alternators, each being direct-connected to an 86-in. Pelton wheel having a normal speed of 450 r.p.m. Water is supplied to each of these units by a 45-deg. branch from the incoming pipe line, the supply pipe diameter being 10 in. and the nozzle diameter 2 7/16 in. There are also in

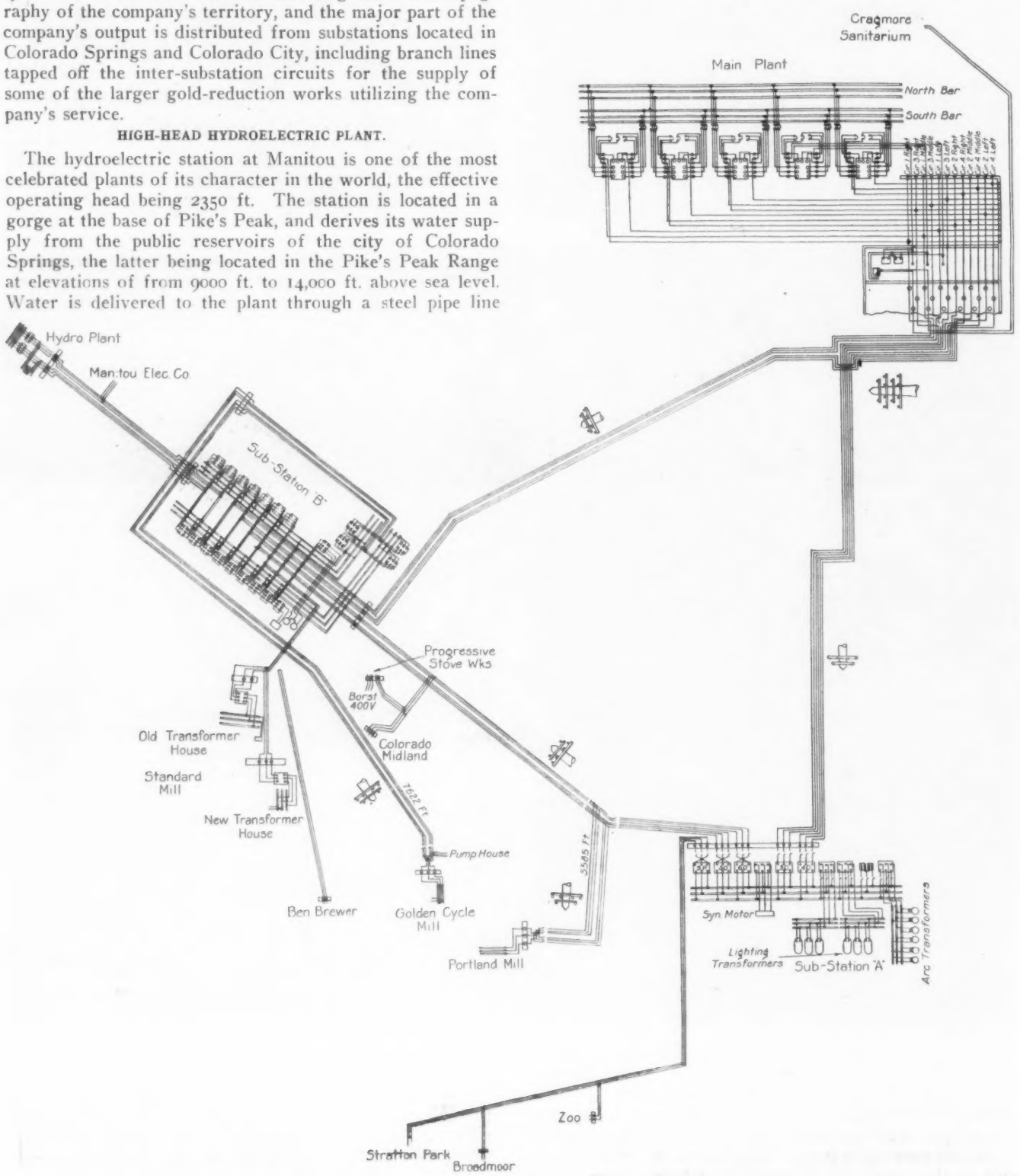


Fig. 2—Distribution System of Colorado Springs Light, Heat and Power Company.

service two 45-kw, 125-volt General Electric flat-compounded exciters, each being direct-driven at 975 r.p.m. by a 42-in. Doble wheel, receiving water from the branch line equipment supplying the main units. The exciter-wheel supply lines are 2 in. in diameter and the delivery nozzles are ⅜ in. in diameter. The pressure end of the pipe line is anchored to a concrete foundation between joints and the lower end is equipped with four relief valves set to open at from 1200 lb. to 1500 lb. per square inch, and discharging into the power-house tailrace through 2½-in. pipes. Each main unit is provided with a gate valve, located in the supply branch and driven by a ½-hp, 125-volt direct-current motor. About thirty minutes are required for closing the gate valve. The company has found that single-gate valves are the only type which is successful under the conditions of head utilized, it being practically impossible to keep either double-gate or wedge-type valves tight. The wheels are controlled by an oil-pressure system, operated from Lombard governors and needle valves,

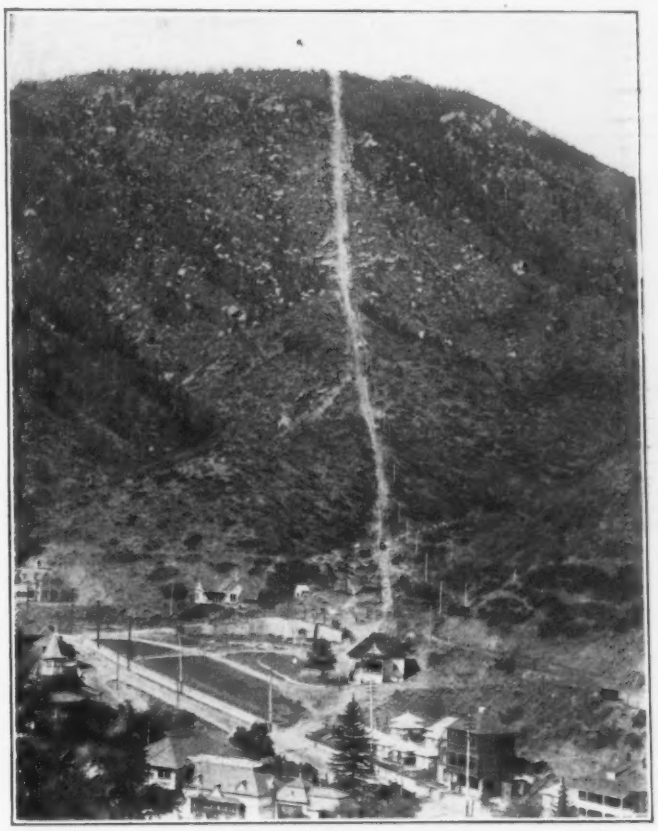


Fig. 3—Pipe Line to Generating Station at Manitou.

the oil pump being driven by a 2-hp motor. The turbine-room is served by a 10-ton Whiting hand-operated crane.

HYDROELECTRIC IMPROVEMENTS.

Extensive tests have been carried on by the company during the past year or two with the object of improving the efficiency of the equipment. The agreement between the company and the city precludes the use by the company of more water than is required by the community for domestic and industrial purposes, the quantity varying widely at different times. In view of the importance of producing energy at Manitou so far as possible, rather than in the company's steam plant, exhaustive studies were made of the shape of the nozzles and buckets, the losses being segregated and compared under different conditions. The flow of the stream was investigated by means of weirs, Pitot tubes and micrometer gages, and the shape of the nozzles changed to approximate more closely the theoretical proportions. During the tests of the wheels investigations were also made of the friction losses in the pipe line, with the result that the losses under the high head employed are considerably less than were anticipated by the ordinary formulas. As a result of the various changes in the wheel and nozzle design the efficiency of the hydraulic units has been increased from about 65 per cent to 80 per

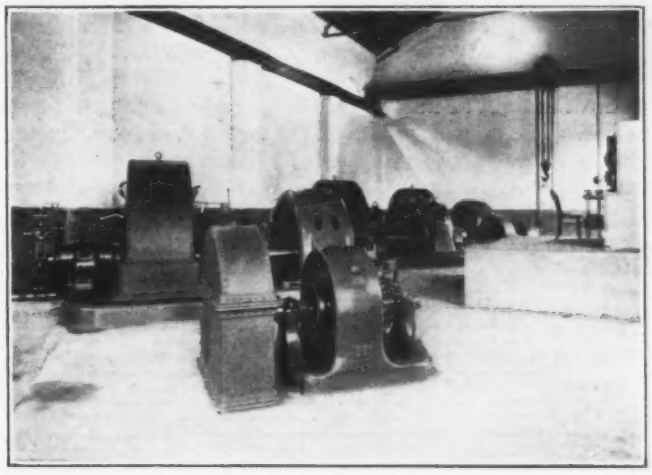


Fig. 4—Interior of Hydroelectric Plant at Manitou.

cent, the former figure having been in effect at the installation of the hydroelectric plant about eight years ago.

A recent improvement at the Manitou station is the installation of a lightning arrester and switch house of brick and concrete construction, in which are located switches and arresters for the outgoing lines, including various local distribution circuits for Manitou. The main switchboard in the plant is equipped with air valves controlling the oil switches used on the circuits, the latter being actuated by compressed air furnished by a 2-hp motor-driven compressor. The details of these oil switches have previously been described in these columns. An important improvement on the hydraulic side of the station consists in the installation of V-shaped baffle plates of cast iron in the path of the discharge from the waterwheels. These plates turn the water backward toward the wheels and eliminate the troubles usually encountered in the discharge of tail water from plants of high head. The high-tension room contains an outfit of General Electric multi-gap lightning arresters, three generator switches, three line switches and a paralleling switch, the latter serving to throw the outgoing inter-station lines into multiple operation. One set of busbars is installed.

LOCAL DISTRIBUTION AT MANITOU.

From the Manitou plant the local distribution service of the town is handled at 2300 volts for both commercial and street lighting, the usual series tub transformers being in-

THE COLORADO SPRINGS LIGHT, HEAT AND POWER COMPANY
DAILY REPORT GENERATION—*Manitou District*

DAY Thursday MONTH July 13 1911

	THIS YEAR	LAST YEAR	INCREASE	DECREASE	PER CENT.
MFG. THIS MONTH TO DATE	501654	533470		31816	5.96
TOTAL K. W. H.	46932	37540			
MAXIMUM AT	2300	1700			
MINIMUM AT	1470	1250			
AVERAGE	1860	1483			
LOAD FACTOR	80.5	87			
POWER FACTOR	81	89.5			
TOTAL GALLONS OF WATER	7072 000				
GALS. PER K. W. H.	153				
TURNS ON TANK	46				
TURNS ON LAKE	20				
MAX. SEC. FEET	13.11				

REMARKS:

Fig. 5—Daily Report from the Hydroelectric Station at Manitou.

stalled for the latter. The local motor service includes many small motors, operating machinery in spring-water-bottling works and small pumps and ventilating fans in restaurants and summer resorts. The street lighting at

Manitou is accomplished by about 300 100-watt tungsten lamps equipped with close-fitting radial-wave glass reflectors, the lamps being mounted about 12 ft. above the street level. The distribution of light is unusually effective. The service is mainly of an all-night character. Other electrical applications at Manitou include the illumination of the celebrated "Cave of the Winds" in Williams Cañon by incandescent and projector lamps, the lighting of the Mount Manitou Scenic Incline Railway by twenty 100-watt tungsten lamps, which outline the entire route against the side of the mountain, so that it is visible for a distance of about 12 miles, and the operation of the inclined-railway

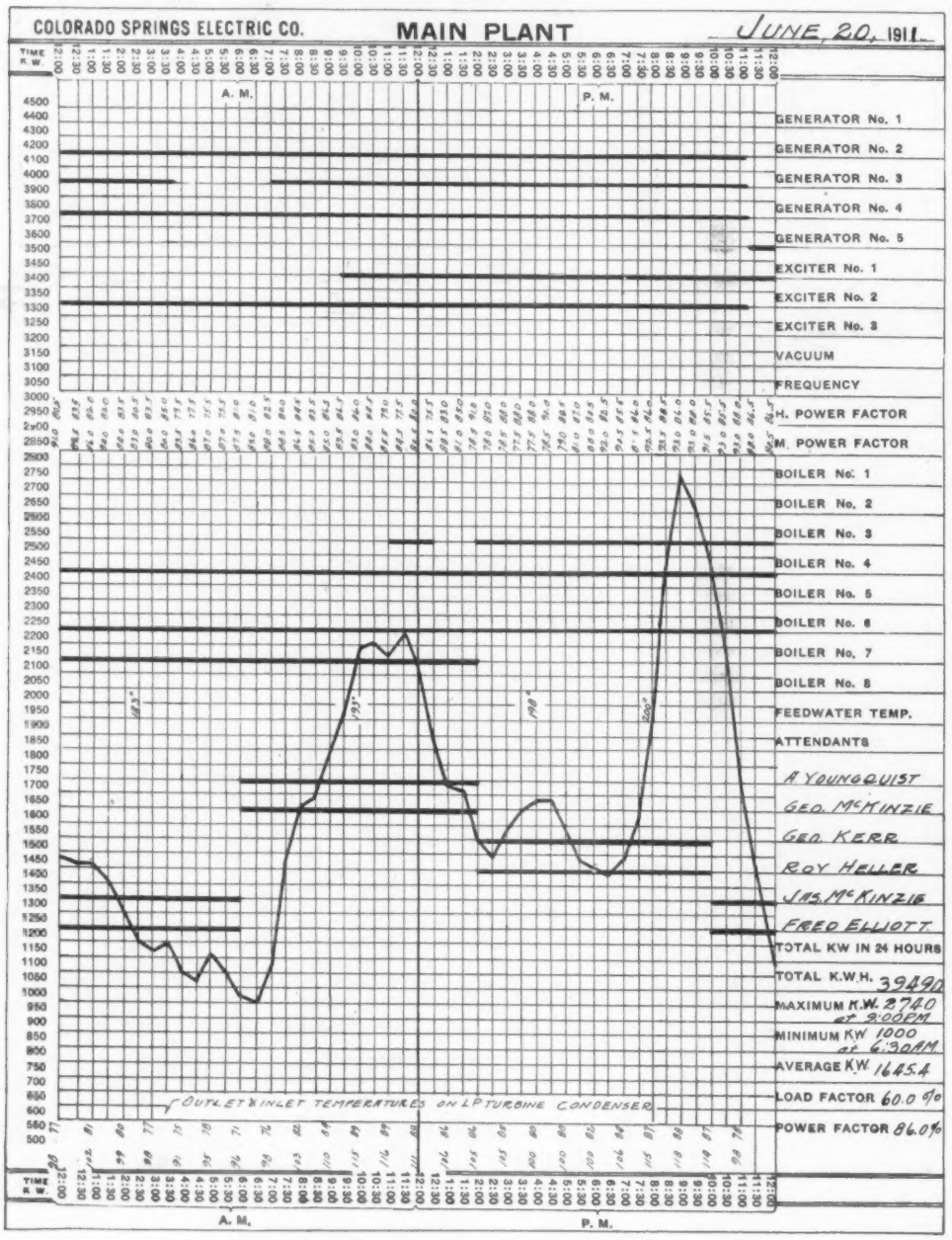


Fig. 6—Generating-Plant Record.

cars. The latter are of the cable type, one car counterbalancing the other, and are operated by a 75-hp, 220-volt, three-phase induction motor belted to hoisting machinery located at the top of the incline. Three 25-kw step-down transformers are installed at the summit of the incline and reduce the potential from 6600 volts to 220 volts for the motor service. Separate meters are installed for the motor and lighting service of the inclined railway, and selector switches, horn-gap and aluminum-cell lightning arresters are in use. The hoisting machinery is driven off a 72-in. pulley by a 16-in. belt running to a 16-in. motor pulley.

REPORTS.

Daily reports at the Manitou station include comparisons of the output on a monthly and diurnal basis, load-factor, power-factor and water consumption data. On a recent typical day the plant produced 46,932 kw-hours, the maximum load being 2300 kw, the minimum load 1470 kw, the load-factor 80.5 per cent, the power-factor 81 per cent, the water consumption at maximum load 13.11 sec.-ft. and the water consumption per kw-hour 153 gal.

MAIN STEAM PLANT.

The steam plant of the company contains two 500-hp and five 400-hp water-tube boilers, operating at 160 lb. without superheating. Coal is purchased from a mine about 1500 ft. north of the plant, which is located on a mesa about 5 miles from the center of Colorado Springs. The generating equipment consists of three 750-kw, 6600-volt, three-phase, 60-cycle, revolving-field alternators, each direct-driven at 90 r.p.m. by a 24-in. x 44-in. x 48-in. horizontal Corliss engine; a 1000-kw Westinghouse low-pressure turbo-alternator, delivering three-phase, 6600-volt current at 1800 r.p.m., and a recently installed 1500-kw Allis-Chalmers high-pressure turbo-alternator of similar electrical rating. The engine-driven alternators are operated mainly in connection with the low-pressure turbo set, the engines being run non-condensing and discharging into the turbine through a 22-in. main exhaust running the entire length of the station. The piping is arranged so that the engines can be exhausted into the atmosphere if desired through an 18-in. trunk line. The high and low-pressure turbines have also been installed to permit joint operation, the valve arangement permitting the former to exhaust into the latter when desirable. The company has obtained a steam consumption as low as 21.2 lb. per kw-hour when running the two turbines together.

Coal is delivered to the steam plant by dump cars running from the mines to the boiler-room, a motor-driven cable being used to haul the cars to the desired point above a storage pocket in front of the furnaces. The cost of handling is about 3 cents per ton, and the fuel used is a lignite, averaging about 9500 pound-Fahrenheit thermal units per pound, the cost at the station being about $1.35 per ton. The capacity of the coal cars is 5 tons each, and the motor which hauls the cable has a rating of 7½ hp. Two coal cars are required for the plant's service. The water supply of the station is obtained from a reservoir located about 18 miles distant in the mountains. Natural draft is employed, and this is obtained from a brick stack 176 ft. high and having a maximum diameter of 13 ft. The draft produced is about ⅝ in. of water column.

A feature of the steam plant is a home-made cooling tower 120 ft. long by 35 ft. high, with a pond beneath, from which injection water is drawn. The low-pressure turbine exhausts into a hot well, which discharges into the tower through a 14-in. pipe, a Westinghouse-Le Blanc condenser being installed between the turbine and the hot well. The high-pressure turbine exhaust is ordinarily delivered to a Connersville jet condenser discharging into a hot well through a 22-in. pipe, the well being connected with the cooling tower by a 12-in. line. Injection water for the Le Blanc condenser is taken from a cold well at the end of the cooling pond through a 12-in. pipe and a second line of the same size is used for supplying the condenser of the high-pressure turbine. The high-pressure turbine condenser is equipped with a centrifugal circulating pump, direct-driven by a 60-hp, 220-volt Allis-Chalmers induction motor, and the Le Blanc condenser is provided with a 100-hp motor-driven pump. Feed water is handled by a 300-hp National heater and by an American heater of the same rating. In operating the low-pressure turbine the engines are used if the load exceeds about 1800 kw; otherwise the high-pressure turbine is operated condensing.

Fig. 7—Exterior of Substation, Colorado Springs.

As soon as the load reaches 1800 kw the service demanded of the reciprocating-engine units is sufficient to give a reasonable steam consumption per kw-hour, and above this point the engines and low-pressure equipment are more efficient than the high-pressure turbine.

TESTS.

Tests of steam consumption at the station have shown that with the 1500-kw high-pressure turbine operating condensing 20.4 lb. of steam are required per kw-hour; with the reciprocating engines and low-pressure turbine in operation the steam consumption is 18.3 lb.; with the two turbines operating together, 21.2 lb., and with the high-pressure turbine operated non-condensing the water rate is 37.4 lb. The vacuum during these tests was 21.5 in. and the average barometer 23.8 in. At the altitude of Colorado Springs water boils at about 198 deg. Fahr. Since the exhaust turbine was installed the force in the fireroom has been reduced by seven men. No change was made in the engine-room or at the switchboard as a result of the introduction of the low-pressure unit.

TEST OF 1,500-KW HIGH-PRESSURE TURBINE.

The following steam-consumption test was recently run by the company upon the 1500-kw, high-pressure turbo-alternator. The turbine-driven generator is rated at 1500 kw at 65 per cent power-factor:

Kilowatts.	Steam per Kw-Hour.	Steam Cor'ctd for Moisture.	Steam Pressure.	Inlet Pressure.	Vacuum.	Temperature Injection Water.
1,760	17.1	16.5	159	126	21.2	61
1,850	18.7	18.1	161.5	131.5	21	59
820	33.8	32.6	160.5	63	21.7	58.5
1,590	16.6	16.0	159	116	20.9	58
1,690	17.4	16.8	160	115	20.8	57.5
2,260	21.5	20.8	157	147	20.6	57
2,370	17.5	16.9	156	146	20.5	60
1,590	28.8	27.8	160	112	21	60
1,205	22.4	21.6	160	89.5	21.3	58.2
1,980	22.0	21.2	158	129	20.7	60

The turbine was operated condensing and independently in this test.

TEST OF LOW-PRESSURE TURBINE AND ENGINES.

Shortly after the installation of the low-pressure turbine equipment the following test was run in connection with the reciprocating engines and turbine, the former being operated non-condensing in connection with the latter:

Duration of test	24 hours
Coal consumed	259,810 lb.
Barometer pressure	11.55 lb.
Gage pressure	148.1 lb.
Absolute pressure	159.7 lb.
Feed temperature	164 deg. F.
Average load	2,105 kw.
Steam per kw-hour	20.95 lb.
Coal per kw-hour	5.15 lb.
Moisture in steam	2 per cent
Dry steam per kw-hour	20.6 lb.
British thermal units in coal	8,537

MINOR ECONOMIES.

Apart from the studies of station economy which the company has made along the line of comparing the efficiencies of different combinations of generating machinery, the operation of the plant has been improved within the past few years by the reconstruction of the coal-handling system, by the improvement of the cooling tower and by changes in the furnace arrangement of the boilers. The original coal-handling system involved the haulage of fuel from the mine track to the boiler-room by hand-barrows. In the cooling-tower service the company has found that by using interstices made by assembling ordinary wooden fence pickets the cooling of the condensed steam is much more effective. On account of the high evaporation at the altitude of the station it is necessary to make up about 80 per cent of the water passed through the boilers.

The furnace improvement consists of the installation of sets of cylindrical firebrick tiling on the lowest and highest rows of tubes, circular sections being used on the lower level and semi-circular tubing being applied to the upper row. The tiling is 4 in. in diameter, and three lengths of 12 in. each are attached to the bottom tubes, two lengths of 12 in. each being fastened to the upper row, all within the first pass of the boiler. The tiling gives a Dutch-oven effect to the furnace and tends to lengthen the time required for the gases to pass through the boiler, with a resulting gain in economy of operation. Other improvements in the steam plant include the packing of two 75-hp engines' valve stems and piston rods with a composition of seven parts tin and one part copper, with resulting increase of service reliability. The cylinders of the large Corliss engines have also been lined with a 5/8-in. steel casting in each case, by which method the original rating of the engines has been maintained for a number of years after the original lining had become worn out. The present fuel consumption of the plant averages about 4.3 lb. of coal per kw-hour in all-day service.

6600-VOLT LINES AND SUBSTATIONS.

Substations are located at Colorado Springs and Colorado City. Each substation is connected with the other by two three-phase tie lines, and, similarly, the steam plant is connected with the two substations by two three-phase circuits, so that electrically these lines form a triangle with double sides. Between the steam plant and Colorado Springs substation two circuits of No. 1 copper, 4.9 miles in length, are run, two circuits of No. 0 copper being run 8 miles between the plant and the Colorado City substation. The two substations are 3 miles apart and are connected by two circuits of No. 1 copper. Between the hydroelectric plant at Manitou and the Colorado City substation two No. 3/0 circuits are run, the distance being 3.5 miles. The potential carried on all these lines is 6600 volts. Two sets of busbars are provided at the steam plant and the regulation of the system is effected by a Tirrill regulator on the main switchboard. By means of double-throw oil switches any outgoing line may be thrown upon either bus set. At Colorado City any incoming line or outgoing feeder may be operated upon either of two sets of busbars, including the local lighting and power service and the special 6600-volt power circuits supplying the larger gold-reduction mills. A 50-kw series lighting transformer is in use at Colorado City for street service, and the local 2300-volt service is also handled by a step-down transformer equipment, but the main purpose of the substation is to serve as a switching and metering point on the system.

NEW COLORADO SPRINGS SUBSTATION.

The substation in Colorado Springs is a new building recently completed by the company. It is located in the business center at the intersection of Sahwatch and Cucharras Streets, adjoining the original steam plant of the company. The substation is a brick and steel structure 85 ft. long by 40 ft. wide, and from it all the local lighting and power service of the city of Colorado Springs is

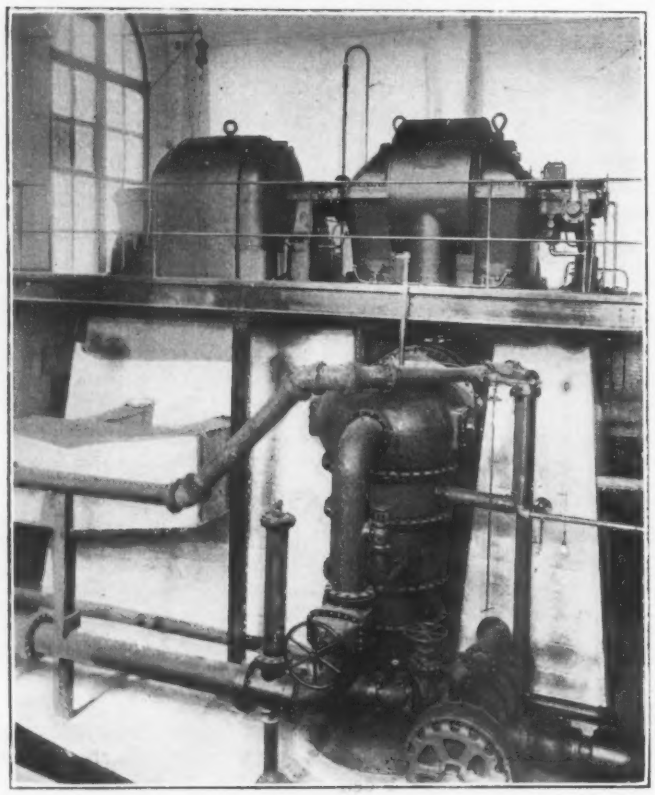


Fig. 8—Low-Pressure Turbine and Condenser at Colorado Springs.

handled, with the addition of exhaust and live-steam heating distributed to the Antlers Hotel and other consumers in the mercantile district. The equipment includes six 375-kw, 6200/2250-volt transformers of the water-cooled type for local lighting service, including small alternating-current motors; seven tub transformers for street lighting; three motor-driven feeder regulators; switchboards for arc lighting and commercial service; a 500-kw synchronous motor-

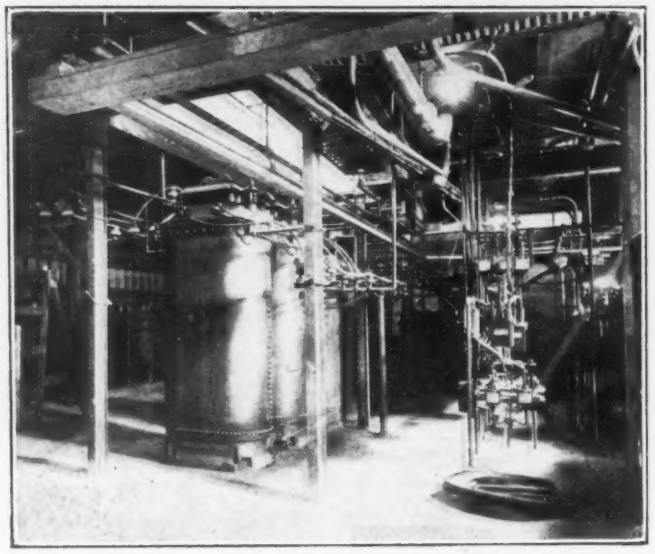


Fig. 9—Basement of Substation at Colorado Springs.

generator set, and a 75-kw induction motor-generator set supplying 550-volt direct-current power service to the center of the city; a 500-kw Curtis turbo-alternator and a 300-kw Bullock alternator, driven by a single-cylinder engine, the two latter outfits being used in connection with the steam-heating service and operated non-condensing at all times. These units are utilized mainly during the winter months, the summer steam-heating service being supplied through reducing valves from a boiler plant located in a building adjoining the substation. The engine and turbine are operated at 120 lb. steam pressure, and each generator delivers 2300-volt, three-phase current to the substation busbars, a single set being provided.

The transformer equipment is located in the substation basement, the floor being provided with openings facilitating the handling of such apparatus by a 20-ton hand-operated crane, which sweeps the operating room.

The main switchboard consists of fifteen panels devoted to feeder service, transformers, an exciter set of the turbine-driven type, the two alternators and the motor-generator sets. Five panels are provided for the arc board. All substation wiring is installed in conduit. A special feature of great operating value is the location of remote-control switches governing the incoming 6600-volt lines inside a sound-proof telephone booth on the main floor of the substation. The 6600-volt lines are controlled by solenoid-type oil switches located in the basement. The push buttons controlling these switches are mounted on a marble panel 30 in. long by 20 in. wide, each switch button being wired with a pilot-lamp outfit showing in red and green the condition of the corresponding circuit. A high-tension voltmeter is mounted above the panel.

STATION LOG.

An unusually complete daily log is kept at the main plant, a letter-size sheet being the standard. A typical log is reproduced herewith, showing for June 20, 1911, a maximum load of 2740 kw, a minimum load of 1000 kw, an average of 1645 kw and a load-factor of 60 per cent. The power-factor for the twenty-four hours was 86 per cent. The log shows the hours of service of each generating unit, the boiler units and the attendants. On the reverse side of each daily log are provided spaces for special notes of operation and a summary of the output of the station. On the day illustrated the exhaust turbine delivered 11,680 kw-hours, the total station output being 39,490 kw-hours. The exhaust

turbine was operated practically all the time, with one or two reciprocating engines. A similar chart is prepared daily in connection with the output of gas manufactured by the company, which also controls the gas production and distribution in the city.

OUTPUT STATISTICS.

The company prepares monthly an exhaustive tabulation of its kw-hour output and distribution, comparing suc-

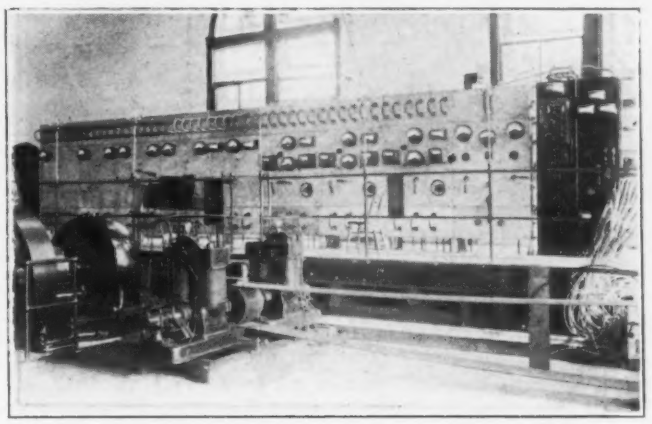


Fig. 10—Switchboard at the Colorado Springs Plant.

cessive years. In 1910 the company generated a total of 25,632,620 kw-hours, and distributed the following output: Gold-reduction works, 16,399,010 kw-hours; miscellaneous alternating-current motors and lighting, 1,422,195 kw-hours; street lighting, Colorado Springs, 637,560 kw-hours; Colorado City, 121,301 kw-hours; direct-current motors, 976,786 kw-hours; general lighting by station meters, including losses in lines and transformers, 3,905,300 kw-hours; total distribution, 23,462,152 kw-hours. Of the total output for the year the hydroelectric station generated 11,827,950 kw-hours, and the main steam plant 12,961,750 kw-hours. The maximum load on the hydroelectric station for the year was 2830 kw and at the main plant 4840 kw. The maximum load on the system was 5160 kw. The average yearly load-factor for the hydroelectric station was 88.5 per cent, for the steam plant 51.8 per cent and for the entire system 69.4 per cent. The street lighting of Colorado Springs was supplied for 4004 hours 33 minutes, the average number of lamps in service being 276, and the wattage per lamp 506.1 at the station. The lamp outages totaled 6934 lamp-hours. The maximum alternating-current commercial-lighting load was 1700 kw.

RATES.

At present the company has 5883 customers, 6479 meters being in service. The lighting rates for residential service are 11 cents per kw-hour, less 1 cent if paid within a specified date. A minimum charge of $1.25 per month, less 10 cents for prompt payment, is rendered. A connection charge of $2 per meter is made if a connection is made for three months or less. The commercial lighting rate of the company is 11 cents per kw-hour for an average use of sixty hours per month, energy in excess of the above being billed at 6 cents per kw-hour, with a 10 per cent discount on each rate for prompt payment. Motor-service rates are offered on a sliding scale, ranging from 10 cents per unit for 150 kw-hours or less per month to 4.5 cents for over 1200 kw-hours per month, with a 10 per cent discount. An alternative power rate is in service, offering, subject to 10 per cent discount, from 7 cents per kw-hour for the first 25 kw-hours per month down to 0.77 cent per kw-hour for each additional unit consumed above 100,000 kw-hours, plus fixed charges determined by the amount of connected load involved in each installation. A single contract blank is used for all forms of electric service, stickers being attached in each case to show the rates offered for the particular kind of consumption.

SIGN LIGHTING.

Conspicuous among the developments of the company's commercial department are the exploitation of electric-sign and window lighting, the stimulation of electric pleasure-vehicle business and the conduct of an electric flatiron campaign. In handling sign lighting the company sells the sign either for cash or in instalments, requiring from four to twelve monthly payments. The rate for sign and window lighting, based upon four hours' use of the lamps connected, nets about 6 cents per kw-hour. In other words, the sign rate is based upon a charge of $1.50 per 2-cp lamp of 15-watt rating per year, less 10 per cent discount. Carbon lamps are chiefly used, although the company is considering the general application of tungsten lamps to sign-lighting service. In several cases a flat-rate contract is made for sign lighting. The most striking example of spectacular lighting is afforded by the El Paso County Court House, which is outlined from tower to basement by about 2480 lamps of 2-cp rating, these giving a total connected load of 37.1 kw, which is carried daily in the summer season from dusk to midnight. In Manitou the local post-office building is outlined in electric lights, the cost being met by progressive citizens of the town. A beginning has also been made in long-hour lighting by the installation of small incandescent lamps in street-corner transparencies giving the names of intersecting thoroughfares. Electric signs are also widely used by rooming houses, laundries, drug stores, parks and mercantile establishments generally. In its electric flatiron campaign the company offered 6-lb. irons through solicitation for a fifteen-day free trial, and in 1910 about 1020 irons were installed, besides 104 miscellaneous heating appliances and washing equipments. The irons were sold for $1 down, plus 50 cents per month, until the cost of $4.50 was met. About 80 per cent of the company's customers are now supplied with electric irons.

ELECTRIC VEHICLES.

The electric-vehicle business is growing rapidly in Colorado Springs, although it is as yet somewhat hampered by competition between commercial garage owners. About seventy pleasure cars are now in use in the city, whose level streets and superb scenery offer an unusually attractive field for this kind of transportation. There are upward of half a

Fig. 11—Distribution Line in Alleys at Colorado Springs.

dozen commercial garages, and numerous private charging equipments have been placed in service. In general the cost of maintaining electric runabouts varies from $30 to $40 per month. In a representative garage of the better class a rental charge of from $12 to $15 per month is made, plus a charge of 10 cents per kw-hour for battery service, the latter including oiling and cleaning. The central-station company does not charge electric vehicles com-

mercially, preferring to leave such business to the garages. Many owners store their machines at home and utilize the garages only for charging and minor repairs. The electric company has recently purchased a 700-lb. electric vehicle and a 1000-lb. truck for meter installation and other service covering wide areas of its territory. Three all-electric garages are now in service in Colorado Springs.

In the small-motor field numerous motor applications are in service, including all but one of the hotels, restaurants, small shops, mercantile establishments and the large number of petty business enterprises which thrive in a city which is widely known as a tourist center. There is but one isolated plant in the city. The most conspicuous hotel installation is that of the "Antlers," which includes a varied equipment of motors for auxiliary service, electric baths and lighting. About 28,500 kw-hours per month are consumed by this establishment. The company's steam-heating rates vary from 70 cents per 1000 lb. for the first 10,000 lb. of steam condensed per month to 45 cents for each 1000 lb. condensed per month above 90,000 lb.

UNIT STATISTICS.

The company's gross income per capita from the sale of electricity in 1910 was $10.50. Including the sale of steam heat, the per capita income, exclusive of gas sales, was $11. The electric-lighting income was $6 per capita. The watts station rating per capita is 175.

OFFICERS.

The officers of the company are: President, Mr. George Bullock, New York; first vice-president, Mr. R. W. Chisholm, Colorado Springs; second vice-president, Mr. S. J. Dill, New York; secretary and treasurer, Mr. J. W. Ryter, Colorado Springs; assistant secretary and treasurer, Mr. Henry Morgan, Colorado Springs; general manager, Mr. George B. Tripp, Colorado Springs; superintendents, Mr. Donald Kennedy, Colorado Springs, and Mr. E. L. Benton, Manitou.

WIRELESS TELEGRAPH ANTENNÆ.

Operating Characteristics of the Umbrella Type of Aerial.

By David Darrin.

DURING the month of May, 1911, an investigation of the operating characteristics of a wireless-telegraph aerial was made at Cornell University by Messrs. F. R. Killick, F. H. Best, D. Darrin, A. L. Richey, S. B. Kent, H. B. Reynolds and L. F. Fuller, students under the direction of Instructor F. H. Kroger. It is believed that a report of the results of this investigation will prove of general interest at this time.

The experiments performed related to a determination of the factors affecting the design of the umbrella-type aerial, the investigation covering the effect produced upon the receiving efficiency by varying each of the following elements, the others remaining constant: Angle of inclination of antenna wires, length of antenna wires, wave-length of signals, number of antenna wires and quality of signals.

WEATHER CONDITIONS.

One important element entering into all experimental and practical work in this field is the variation in results obtained under various weather conditions. This factor is hardly capable of more than a very rough analysis, but a method was employed to correct the observations for all variations due to changes in weather conditions from day to day. In general, the weather during May, when the tests were made, was very hot and dry, but there were some cloudy, moist days, so it was thought advisable to apply a correction for weather conditions.

EQUIPMENT.

Of primary interest and importance in the review of this work is a clear understanding of the nature of the apparatus used. A large portion of this apparatus was constructed by the members of the test party and at a very small expense.

The sending station was located at Franklin Hall, where

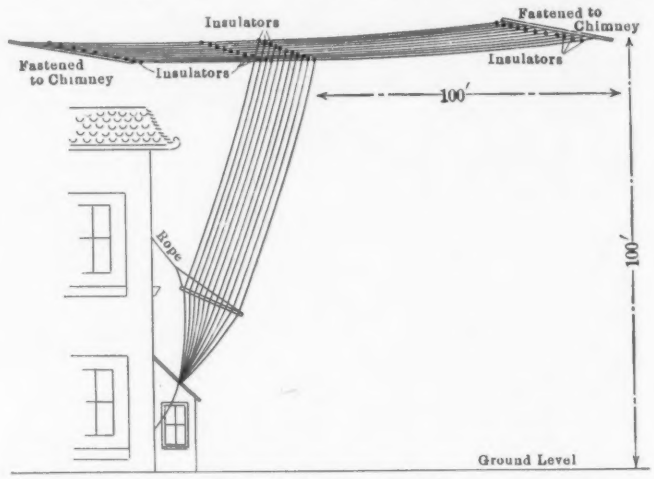


Fig. 1—Sending Aerial.

there was erected a 100-ft. eleven-wire aerial of the horizontal type shown in Fig. 1. The sending equipment here consisted of an open-core transformer, a variable tuning helix, a variable reactance coil, a variable resistance frame, a fixed and a rotary spark-gap, a sending key and measuring instruments for recording the sending data, namely, a voltmeter, an ammeter and a wattmeter for the 220-volt primary circuit and two hot-wire ammeters for the high-frequency secondary or aerial circuit. This apparatus is shown diagrammatically in Fig. 2. The receiving equipment at Franklin Hall consisted of variable inductance and variable capacity tuning apparatus, silicon detectors and a sensitive double-receiver head telephone, as shown in Fig. 3. For the purpose of determining the wave-length of signals when sending there was also installed at this station a wave-meter, as shown in Fig. 4, equipped with a variable capacity, a variable inductance, a silicon detector and both a telephone receiver and a very sensitive hot-wire ammeter.

The receiving station was located on Cornell Heights, approximately 2000 ft. from the sending station. It consisted of a square wooden tower measuring 8 ft. x 8 ft. at the bottom, 3 ft. x 3 ft. at the top and 43 ft. in height, with a pole extending from the top to a height of 57 ft., as

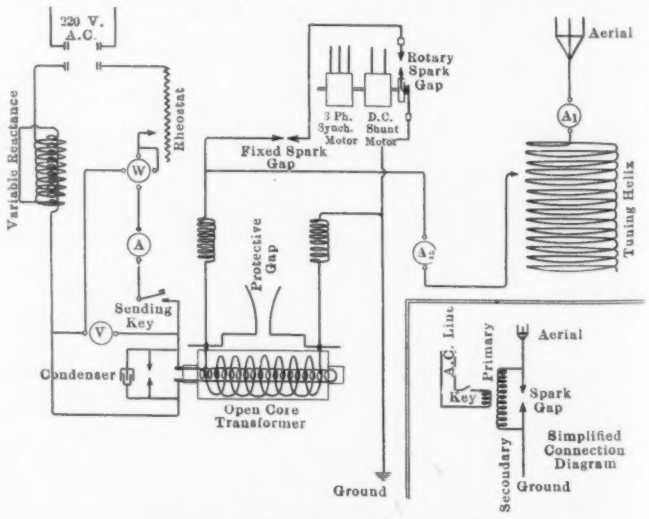


Fig. 2—Sending Station Circuits.

shown in Fig. 5. A small shanty was placed inside the tower at its base to hold the receiving-station apparatus. The aerial at this station was of the umbrella type and was the one on which the tests were made. An iron col-

lar was placed around the above-mentioned pole and arranged so as to be easily raised and lowered for necessary adjustments and changes in the antennas. From this collar flexible leads ran down the side of the tower to the receiving instruments and then to the ground. Also from this collar as a center the antenna wires radiated outward,

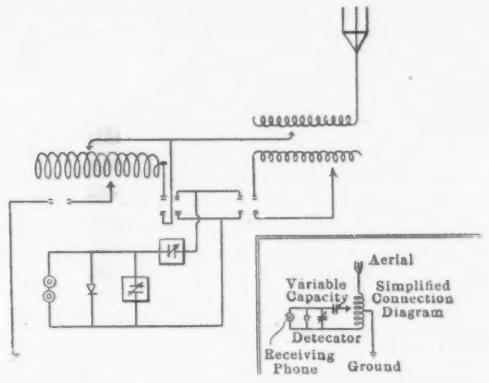


Fig. 3—Receiving Circuit at Franklin Hall.

as shown in Fig. 5. The receiving equipment here consisted of two variable inductances (coarse and fine adjustment) for tuning, a silicon detector and a sensitive double-receiver head-telephone and, for all of the quantitative test measurements of receiving currents, a very sensitive ammeter of the Fleming type was made and used. This instrument is shown in Fig. 7 and is the same as that described by Prof. G. W. Pierce in his "Principles of Wireless Telegraphy," wherein he demonstrated that the deflections of the instrument are proportional to the square of the currents through it. From this fact it follows that the square roots of these deflections are proportional to the currents, and in the following discussion the current values are obtained in this way. The limited time available for testing did not permit the determination of the absolute values of the receiving currents, but as all data are used in a comparative way only, this fact does not detract from the value of the results obtained. For the purpose of communicating orders to the sending station there was also installed at this station a sending set consisting of a battery of eight dry cells, a small auto spark coil, a fixed zinc spark-gap and a sending key, as shown in Fig. 6.

TESTING METHODS.

The first two tests were performed together in the following manner: The sending station was arranged to radiate energy in the form of electric waves at constant amperage and constant wave-length (the contact sending key being held down continuously during the whole of each

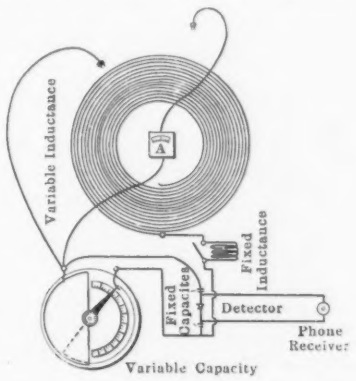


Fig. 4—Wave-Meter.

run of approximately five minutes in order to have a steady uninterrupted outflow of energy). At the receiving station the aerial was tuned for maximum reading of current received under varying conditions of length of antenna wires and angle of inclination of antenna wires with the vertical. A hand-level was used to obtain the readings of height h, and "current" readings were simply the square roots of ammeter deflections.

The third and fourth tests were run in a manner very similar to that of the first two. The sending station was operated to give constant amperes radiation as in tests one and two, but the wave-length was varied for tests three and four. The receiving data were obtained in a similar manner to that for the first two tests and the only

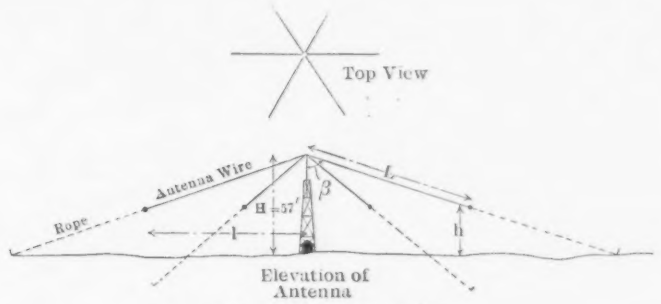


Fig. 5—Receiving Aerial.

difference was that a change was made in the variable elements. The receiving data taken May 22 for 500 m (1640 ft.) wave-length served as a basis for correction of the observations of receiving current values in all other tests at the same wave-length, but under varying weather conditions. The fact that these other tests were made on different days and under widely different weather conditions made necessary the application of some correction to bring them all to the basis of weather conditions on one day. Hence, on May 22 readings were taken at a constant value of the angle of inclination and at varying values of length of antenna wires and the results of these observations were recorded graphically, as shown on the weather correction of Fig. 8. From this curve a corrective constant was obtained for the readings at each value of length of wires.

The fifth test will be discussed under the heading of "Results" for the reasons there explained.

RESULTS OF TESTS.

For the sake of clearness in summing up the results obtained in the various tests it is thought best to refer to the statement of the objects of these tests and to take up the five points there outlined in regular order. Each of

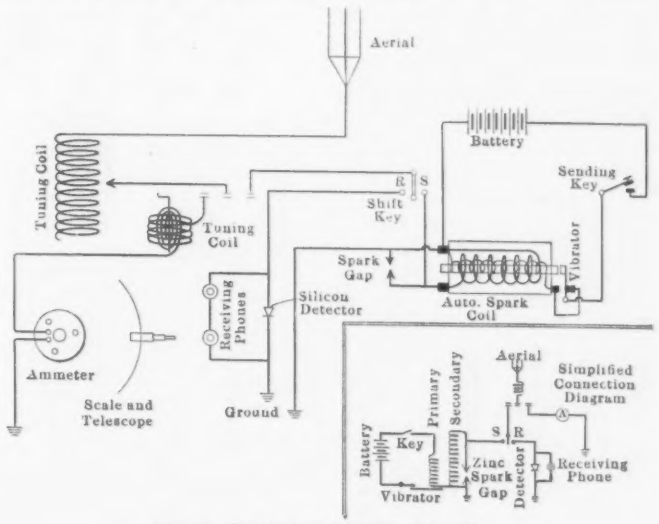


Fig. 6—Receiving-Station Circuits.

these is capable of being discussed entirely independently of the others, and this will be done. Finally, in closing a general discussion of the results as a whole will be given with an explanation as to the way they may be applied to the practical design and operation of wireless stations.

The angle of inclination of the antenna wires has a

very important bearing on the receiving efficiency of an umbrella-type aerial. In Fig. 9 are plotted curves representing the results of the first and second tests, and from an inspection of these curves three points stand out very clearly, namely: That the receiving current increases with an increase of the angle of inclination of the antenna wires; that the rate of this increase is greater as the length of antenna wires increases; that for any constant value of length of wires the rate of this increase decreases as the

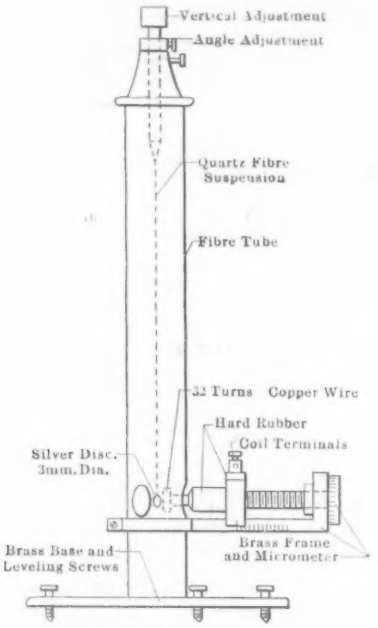


Fig. 7—Receiving Ammeter

angle of inclination increases. From the curves it might be predicted that the maximum receiving current for any given length of wires would be obtained at some value of their angle of inclination approximately equal to 90 deg., but as no tests were made at values of β exceeding approximately 75 deg., the exact position of the maximum point in these curves can only be predicted roughly. The curves would appear to be hyperbolic in form, but no mathematical statement of their general form of equation would be allowable without more extensive investigation and more complete data on that point.

The length of antennae wires is also a very important factor in the design of this type of aerial. From the curves of Fig. 9 a second set of curves for the same data was derived, as shown in Fig. 10. An advantage of this second set is that the ratio of L/H is used, thus eliminating the actual values of L and H, and making the application more general. Two points stand out most prominently in

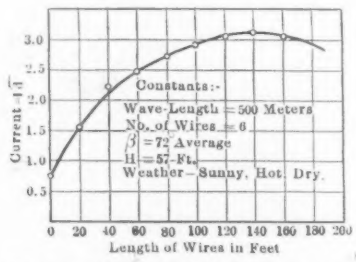


Fig. 8—Weather-Correction Curve.

connection with these curves, namely, for any given value of the angle of inclination there is a certain value of L/H which will give the maximum receiving current, other conditions being constant; as the value of β increases the value of L/H for maximum receiving current also increases, as does also the maximum receiving current.

From these curves it might also be predicted that at some value of β approximately equal to 90 deg. any increase in the value of L/H would produce an increase in receiving currents. This can only be roughly predicted because no tests were made at values of β exceeding 75 deg. The dotted-line curve on Fig. 10 passes through the maximum point on each of the solid-line curves and its value will be discussed in the final summary.

The wave-length of signals has an interesting and important bearing on the receiving efficiency of this type of aerial. A glance at the curve of Fig. 11 will reveal the fact that an increase in wave-length produces a decrease in receiving current and vice versa, other conditions remaining constant. This curve would seem to be hyperbolic in form and would indicate that an infinite receiving current might be attained if the wave-length could be reduced to an infinitesmal. This relation was not investigated through a sufficiently wide range to allow of any

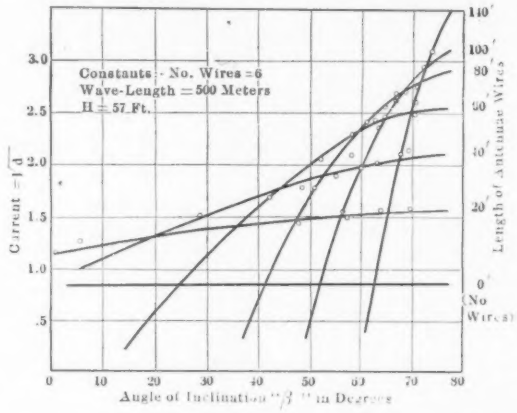


Fig. 9—Variation at Current with Angle of Inclination.

statement of the mathematical form of the equation of this curve and a further study of the limits in the application of the curve might disclose facts of value in the problem of wireless-energy transmission.

The number of antenna wires has a decided bearing on the receiving efficiency, as shown in Fig. 12. This curve hardly requires discussion except to call attention to the fact that the extra expense and bother of installing and maintaining an aerial of more than six wires is not justified by the slight increase in receiving current obtainable by such increase in the number of wires.

The quality of signals was the last feature to be investigated in determining the elements that effect the receiving

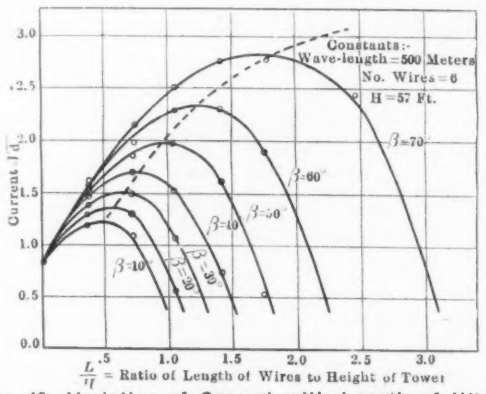


Fig. 10—Variation of Current with Length of Wires.

efficiency of an aerial. In this test the object was to compare the oscillations of the fixed and rotary spark-gap as used in the other tests with those set up by a Paulsen arc sending apparatus. This latter formed part of the wireless equipment at the sending station at Franklin Hall and consisted of an arc between a copper and a carbon electrode (both water-cooled) inclosed in a metal casing con-

taining an atmosphere of illuminating gas and exposed to a very powerful magnetic field perpendicular to the axis of electrodes. Owing to trouble in the operation of the arc the results obtained were very unsatisfactory, but the substance of such tests as were made is as follows:

	Spark Discharge.	Paulsen Arc.
Wave length, meter	500	800
Current—$\sqrt{d}$	1.29	1.35

The fact that under poor operating conditions and in spite of greater wave-length of oscillations the arc produced a higher value of receiving current would suggest the possibility that under favorable conditions it might be much superior to the spark discharge as a sending medium.

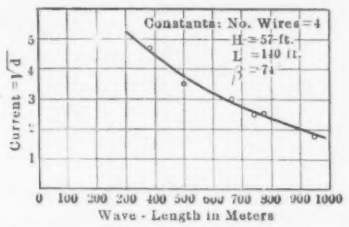


Fig. 11—Variation of Current with Wave Length.

SUMMARY.

The general discussion of the results as a whole will be confined to a short explanation of the manner in which these results can be applied to the designing or remodeling of wireless aerials of the umbrella type and will close with a word as to the field for further investigation and experiment in this line. As previously stated, six wires are sufficient in any case and more than six will give only a very slight increase in receiving efficiency. The fact has been clearly demonstrated that an aerial which is properly designed for high receiving efficiency will have high sending or radiating efficiency, while the converse is not necessarily true; for this reason only the receiving efficiency was considered in making the tests. Generally the value of β, the angle of inclination of the antenna wires, cannot be made over 75 deg. unless poles are used to support the outer ends of these wires. From the dotted-line curve on Fig. 10 it will be noted that, if the angle β can be determined or assumed, a value of L/H for maximum receiving current can be obtained from the curve by interpolation. Assuming then that $\beta = 65$ deg. is to be used, it is seen from the dotted line curve, Fig. 10, that the best results can be obtained by using wires 1.5 times as long, approximately, as their height above the ground at their inner ends. If poles are to be used, the writer believes that a value of $\beta = 90$ deg., approximately, should be obtained, and that in this case the longer the wires are the greater will be the receiving current within reasonable limits. It must be understood that an increase in length of wires means an increase in wave-length unless series capacity is introduced into the oscillating aerial circuit, and this is not desirable for several reasons, mainly because of lack of sensitiveness in tuning. The increase in wave-length in turn means a decrease in receiving currents, so that the increasing of length of wires if carried too far may cause a decrease instead of an increase of receiving currents. A knowledge of the approximate range of wave-lengths to be received should, of course, precede any work on the design of the aerial, but with that knowledge and the above curves a very efficient aerial can be made.

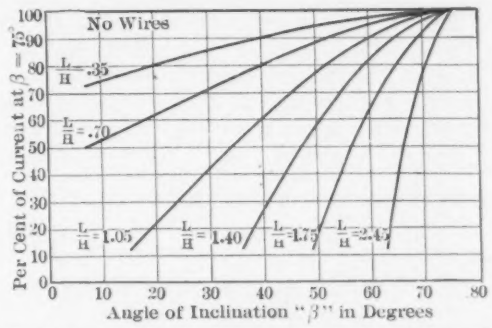


Fig. 13—Variation of Per Cent of Current with Angle of Inclination.

Fig. 13 has been derived from Fig. 9 by assuming that $\beta = 75$ deg. is the highest value of angle of inclination obtainable and taking the current at this value as 100 per cent. From these curves for various lengths of antenna wires can be determined immediately what per cent increase in receiving current can be obtained by an increase of β with any given length of wires. This information would be of service in deciding upon the advisability of changing the dimensions of an aerial already in operation.

A very important point which could not be investigated in this series of tests is the effect of varying H, and this would be a simple and very interesting point for future investigation. Experiments should also be made on the effect of variation of β from 0 deg. to 90 deg. and from 90 deg. to 180 deg. Further experiments on the effects of varying wave-length on the values of receiving currents would without doubt reveal some valuable information.

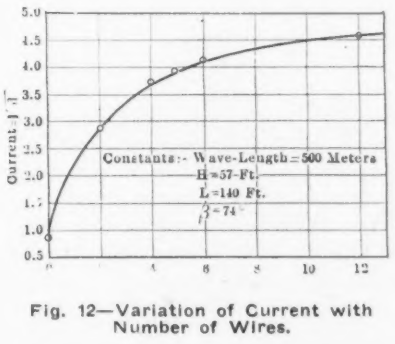
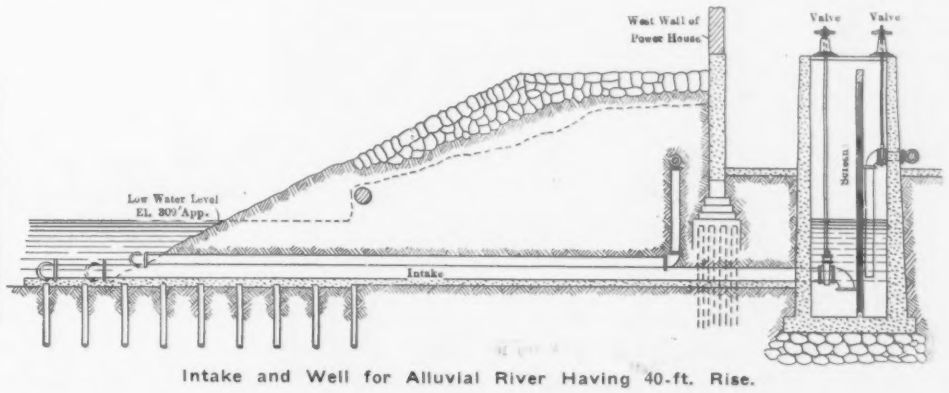


Fig. 12—Variation of Current with Number of Wires.

AN 18,000,000-GAL. PUMPING LOAD.

The Kansas City Electric Light Company has just begun service on its contract with Armour & Company to pump 18,000,000 gal. of water per twenty-four hours for the latter's Kansas City packing plant. For several years the electric company has been furnishing the packing plant 6,000,000 gal. daily from a motor-driven pump on a barge anchored in the Kansas River near its generating station.



Intake and Well for Alluvial River Having 40-ft. Rise.

The permanent new installation for delivering the larger quantity comprises a 500-hp, 6600-volt, 25-cycle motor, driving a single-stage centrifugal pump. This equipment is located in the basement of the company's generating station.

The pump delivers into a 30-in. pipe leading to the packing plant, against a hydrostatic head of 111 ft. This water is used principally for cooling purposes in the refrigerating plants, and is required in nearly uniform quantities throughout the twenty-four hours.

The former 6,000,000-gal. pump, with its motor, was mounted on the barge to take advantage of the shifting channels of the Kansas River. The barge can be anchored over any deep channel which remains when the river is very low. The pump discharges through a 20-in. flexible hose into a vertical riser mounted on a pier abutment. This pipe is tapped with flanged openings at 1-ft. intervals, so that the hose can be accommodated to the varying heights of the river.

The accompanying sketch shows the special intake for both the plant condensing water and the Armour supply. This intake has been designed to operate with the 40-ft. rise and fall in the Kansas River and Missouri River levels. The 40-in. inlet pipe will pierce the new protective level, entering through a valve and elbow the concrete strainer well, 16 ft. in diameter and 55 ft. deep. The strainer panels divide this well into two unequal parts, from the smaller of which the suction line of the pump takes its water.

Central Station
Management, Policies and Commercial Methods

LARGE NUMBER OF NEW CONTRACTS IN DETROIT.

August was an exceptionally busy month for the Edison Illuminating Company, of Detroit, the net gain in new customers being 1059. Even this record was broken, however, in September, when the total number of contracts closed was 2249, representing a net gain of 1173 customers. According to the 1910 United States Census, Detroit had a population of 465,766, and its ratio of electric-light users to total inhabitants, especially among the smaller residences, is among the highest for the cities of the United States. The sales manager of the Detroit Edison Company is Miss Sarah M. Sheridan.

WANTS NO REVENUE THAT IT DOES NOT EARN.

One great point made by the Byllesby electric-service properties is in keeping in touch with the public. Constant efforts are made to emphasize this point. The following card, inclosed in local letters by the Mobile (Ala.) Electric Company and signed by the president of the company, is an example:

"The Mobile Electric Company wants no revenue that it does not earn. Its management believes that an utility corporation can be conducted to the satisfaction of the public and stockholders—and be fair to each. No individual nor any corporation can be absolutely perfect; the best we can do is to make an earnest effort always in the right direction. You will find us anxious to investigate defects and errors and to apply correction. Do us the favor of making our office the *first place* you lodge a complaint."

ELECTRIC SIGNS IN BALTIMORE.

Baltimore is rapidly becoming a brighter city at night through the installation of electric signs. During the past two months more have been put up than the entire number previously installed. Even the smaller shopkeepers are receptive of the proposition of electric signs, and by great effort all former restrictions regulating the length of these signs have been repealed by the authorities. The local electrical contractors have set an example and practically every dealer in Baltimore has erected a creditable mechanical sign. The Blumenthal-Kahn Electric Company has a fan with streamers waving with good effect; Prather & Company have a very massive sign that can be seen for squares away, and Eugene Rosenfeld & Company are erecting a sign at the present time, which will probably eclipse anything so far erected in Baltimore. The flasher which will operate this sign is represented as being the most complicated one ever made and it is on exhibition in their windows on North Howard Street. The Consolidated Gas, Electric Light & Power Company has solicitors at work and the company is mailing literature to its consumers explaining the advantages of the electric sign for advertising purposes.

SEVEN THOUSAND ONE HUNDRED INCANDESCENT LAMPS IN TOWN OF 2100 POPULATION.

The town of Sabetha, Kan., with a population of 2100, has 7100 incandescent lamps connected to its municipal electric-lighting system. Of a total of 700 houses, 600 have the electric light and exhaust steam heat from the municipal lighting plant is supplied to 500 houses and electric power to factories and many houses for domestic purposes. The plant has also an ice-making auxiliary. Mr. George E. Johnson, a graduate of Armour Institute, is engineer for the town, which also owns its water works. Mr. Johnson is assisted in his engineering work by his wife, who is a sister of Maude Adams, the actress.

HOUSE-WIRING RESULTS OF CHICAGO TWO YEARS-TO-PAY CAMPAIGN.

As the result of the two-years-to-pay campaign inaugurated by the Commonwealth Edison Company four years ago, 2933 houses have been wired at a total cost of $431,000, or an average outlay of about $147 per house. The Commonwealth company now has 144,000 customers in Chicago.

CENTRAL-STATION STEAM HEATING IN LOUISVILLE.

An ordinance has been introduced in the General Council of Louisville creating a franchise for the supply of steam heat in the central section of the city. The ordinance was put forward by the Kentucky Electric Company, of which R. E. Hughes is president.

The ordinance provides the following rates: On a meter basis, $1 per 1000 lb. for less than 2500 lb. of condensation and 50 cents per 1000 lb. for excess. The flat rate is based on the required condensation and may equal but not exceed

40 cents per square foot for the heating season. A discount of 10 per cent from the rates is to be given by the operating company.

In its appeal for the passage of the franchise ordinance the Kentucky Electric Company emphasized the fact that a marked abatement of the smoke nuisance will be effected and that in the manufacture of steam for heating purposes the company can assure the emission of no smoke, a provision being inserted in the ordinance providing that the franchise and bond be forfeited in the event that smoke is discharged.

A petition in favor of the franchise circulated among business men affected resulted in 250 names being secured, these including bankers, owners of office buildings, etc. It is said to be certain that practically all private plants in the steam-heating district will be abandoned when the new system is installed. The Board of Fire Underwriters of Louisville has also transmitted to the Mayor a communication stating that a reduction in fire insurance rates will follow the elimination of private heating plants in the business district.

The Kentucky Electric Company has stated that its rates will be made so low that private-plant operators will find it profitable to purchase the central service and that the installation of the heating system is for the prime purpose of enabling it to eliminate the necessity for private plants, so as to get the electric business now being held back by reason of private plants being kept in operation to supply heat.

The ordinance which has been introduced provides for the sale of the franchise at public auction. It is not known whether any of the other local lighting companies will enter a bid for the privilege. The upset price is fixed at $500.

INCOME AND OUTGO OF A LARGE CENTRAL-STATION'S CASH.

Mr. George E. Burns, of the accounting department of the Commonwealth Edison Company, Chicago, read a paper on "The Income and Outgo of Our Cash" before the company's N. E. L. A. Section at Handel Hall, Chicago, on Oct. 3, giving some interesting figures of the magnitude of the business handled by the Chicago company.

The gross earnings of the Commonwealth company are now about $13,000,000 annually, out of which is paid $8,500,000 for expenses, including depreciation. The 3502 employees of the company earn an annual wage of $2,759,000, an amount approximately equal to that returned as dividends to the stockholders, the balance of the surplus being carried to the reserve. The accounting department, which handles customers' bills, company business, etc., alone employs 177 persons. The six credit men who pass on all new contracts are members of this department. Eleven thousand contracts per month, or 425 per day, are handled by this group.

Where a new customer's credit is in doubt he is required to file a deposit or a guarantee signed by a property owner. Of the company's 144,000 customers, however, only 6968 now have deposits. The present number of deposits totals $109,000 and earns 5 per cent interest for its owners. Thirty-four bookkeepers are employed to make out customers' bills, post accounts and prepare accounts for collection, each bookkeeper having about 4500 customers to take care of. During August, a typical month, 162,000 bills were sent out. The light and power business for that month totaled $771,000 and the railway business $250,000.

About one-fifth of the light and power bills are paid directly to the company's thirty-four collectors. Nearly 20,000 or 5 per cent of the customers take advantage of the express company's office collection plan, by which, with a fee of 5 cents additional, electric bills can be paid at any of the numerous offices of the express company scattered throughout the city. Of the 5-cent fee, 2 cents goes to the agent receipting for the payment and 3 cents to the express company. To provide for errors, rebates, etc., about one-half of 1 per cent has to be carried over, while an equal amount is allowed for uncollectible bills, but through credits received these items total only about three-fifths of 1 per cent of the total amount billed.

Mr. E. F. Smith, chairman of the section, who presided at the meeting, called attention to the significant relation between the total salary roll and the dividends returned to the stockholders, amounts which are practically equal. Referring to the growth of the Commonwealth Edison Section of the N. E. L. A., he said that the membership of that section now equals one-sixth of the entire Class D membership of the association. Messrs. H. E. Addenbrooke, D. W. Roper, J. W. Ferguson and E. J. Fowler also took part in the brief discussion which followed.

After a short recess Mr. Harry P. Smith entertained the meeting with vocal selections and was followed by Mr. Frank Savage, who, on account of the illness of Mr. J. T. Mountain, read a paper prepared by Mr. Mountain on a recent trip made by the two to Panama, South American and West Indian points. The paper was illustrated with a number of interesting lantern slides.

THE GROUNDING OF SECONDARIES IN THE ROCKY MOUNTAIN REGION.

By W. J. Canada.

Up to October, 1908, the grounding of secondaries for protection against entrance of higher than normal voltage into connected buildings had received no attention in the Rocky Mountain region. The successful operation of lighting circuits in several Eastern cities with the grounding was considered no argument in favor of placing grounds on secondaries in high altitudes, where lightning troubles were judged to be more severe and the grounding apparently an invitation for trouble.

Investigation and trial of this connection were strongly urged upon service companies by the Rocky Mountain Fire Underwriters' Association. Data were presented on deaths and fires obtained throughout the entire country and many instances were shown where operating costs were distinctly lessened by grounding and the advantages gained in lowered hazard to life and property were pointed out.

In 1909 only one town—Julesburg—undertook grounding; in 1910 thirty-four made trial of such connections, and in 1911 out of 103 cities served by electric-light companies fifty-four had grounded secondary protection and fourteen cities and towns required such connections by ordinance.

Wherever water-works systems are available connection is made to them by a conductor not smaller than No. 4 B. & S. gage, at least one connection being used to the block. This method is followed in Denver, where every new or rewiring installation is required by ordinance to have the neutral wire connected thoroughly to the conduit through a lug provided on the service cabinet and both thoroughly grounded to the main water-service pipes outside the water meter in the few buildings having metered water service.

The grounding in Denver has been followed by less personal injuries, less fires, less transformer losses and quicker detection of line troubles. So good has been the satisfaction that the Denver Gas & Electric Company is now engaged in providing all three-phase motor circuits with grounds on one leg and also on the motor frame.

In Akron, a small town in eastern Colorado, use is made of driven pipe ground on neutral and an arrester on each outer secondary. Mr. J. E. Rogers, of the Akron company,

says: "We consider grounded secondaries as a great protection from lightning," a sentiment which it was impossible to elicit in this territory three years ago.

The Central Colorado Power Company operates at altitudes of from 5000 ft. to 12,000 ft. a 100,000-volt transmission, 13,000-volt distribution, 440-volt, three-phase motor secondaries and 110-220-volt, singe-phase lighting secondaries. This company was the first to ground all final secondaries, and after two years' such operation it has not experienced a single loss of life or property. In very dry, rocky locations this company uses a number of driven pipes covering a considerable area.

In Leadville the peculiar condition is found that during early spring thaws persons on the damp surface ground have shunted the ground pipe driven into deeper frozen earth, thereby being subjected to severe shocks. This result is being avoided by installing considerable grounding surface just below the ground level, in addition to deeply driven pipe grounds.

In only two towns has experience apparently been that grounding has increased the transformer losses. This result may readily be due to a succession of storms of unusual severity about those towns, as the experience of the remaining fifty-two cities and towns is uniformly good. It is safe to expect that another year or two will see the conversion of practically all Colorado electric-light company managements to the use of grounding as a safeguard to life and property.

CONTRACTOR'S TRIBUTE TO ELECTRICITY.

The engineers of the Rochester Railway & Light Company are ever alert for new fields to conquer and do not let many opportunities slip through their fingers, as the illustrations published herewith show. Not content with securing an excellent day load from a contractor engaged in digging a diverting sewer as a part of the system to carry the sewage of Rochester to Lake Ontario, the company has evidently placed the contractor in such a happy frame of mind by the excellent service rendered that he is anxious to let everyone else know the advantages he enjoys in using electricity.

The construction of the diverting sewer is carried on 50

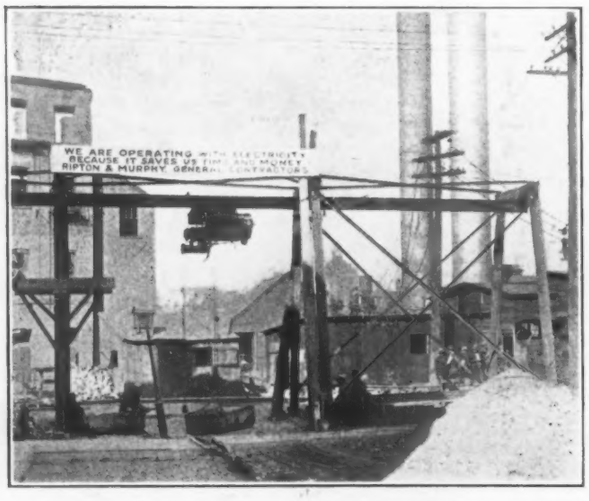


Fig. 1—Electric Hoist Used in Excavation Work in Rochester, N. Y.

ft. below street level and through solid limestone. The tunnel excavation is approximately 6 ft. x 8 ft. in section and 9000 ft. long. Every speck of the work on the contract is done by electricity. The holes for blasting are drilled by air from a 200-hp electrically driven compressor, located centrally on the contract just outside No. 3 station, off the Rochester Railway & Light Company. There are five traveling hoists of Sprague make, as shown in the engravings, in addition to two hoists rented by the Rochester company. The latter machines were described in these columns Nov. 18, 1909, and were built after designs of the engineers of the company, who desired an efficient but low-priced hoist that could be rented to contractors throughout the city. The company has five of these hoists in service practically 50 per cent of the time. The two in use on the diverting sewer are employed to bring up the spoil through the shafts. The latter, as well as the tunnels, are illuminated throughout by electricity. Contract work of this kind is exceptionally profitable inasmuch as it is long-hour summer business.

There is a large concrete bridge being built by the city over the Genesee River at Central Avenue, immediately ad-

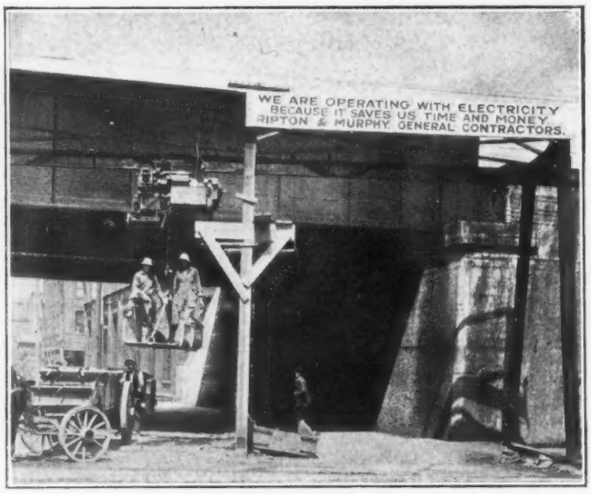


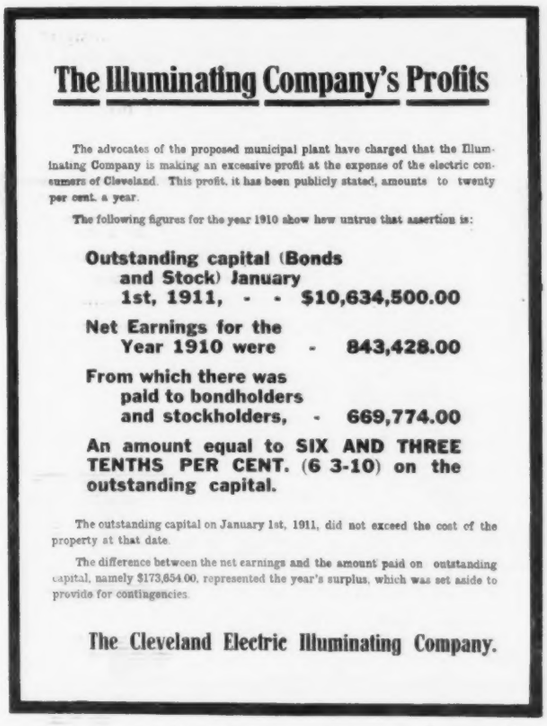
Fig. 2—Showing Contractors' Tribute to Electricity.

joining the New York Central Railroad, and all work on this contract is also done with electricity purchased from the central-station company. Two rented hoists, two concrete mixers with charging elevators, the power equipment of which was adapted from steam to electric drive by the engineers of the Rochester company, a centrifugal pump, a circular band saw and other apparatus is connected. In addition direct-current is being used to cut up the trusses of the old steel bridge which is being replaced. The contractor on the job is said to have expressed his regret that he had not used electricity some time ago, and said it was the best thing he had yet run across. A concrete mixer which had stood idle for four weeks was needed one morning for a batch of concrete. All the contractor had to do was to send a man over to close the switch, and, as he said, he did not have to wait to make a fire and raise steam on his boiler and then find that the equipment had got rusted up and out of commission.

CENTRAL-STATION PUBLICITY IN CLEVELAND.

In order to counteract the impression that is being made by Newton D. Baker, candidate for Mayor of Cleveland, Ohio, to the effect that the Cleveland Electric Illuminating Company is paying enormous dividends to its stockholders, newspaper space has been purchased and the company is setting out in clear, black type the actual facts. Mr. Baker is a pupil of the late Tom L. Johnson and, as such, seems to have retained the desire to fight the Illuminating Company in politics and through suggestions of strong competition. The small municipal plants that were taken over

with the annexation of two suburbs form the basis upon which Mr. Baker proposes to build competition, because of the fact that their records have been fair for the past year



The Illuminating Company's Profits

The advocates of the proposed municipal plant have charged that the Illuminating Company is making an excessive profit at the expense of the electric consumers of Cleveland. This profit, it has been publicly stated, amounts to twenty per cent. a year.

The following figures for the year 1910 show how untrue that assertion is:

Outstanding capital (Bonds and Stock) January 1st, 1911, - - $10,634,500.00

Net Earnings for the Year 1910 were - 843,428.00

From which there was paid to bondholders and stockholders, - 669,774.00

An amount equal to SIX AND THREE TENTHS PER CENT. (6 3-10) on the outstanding capital.

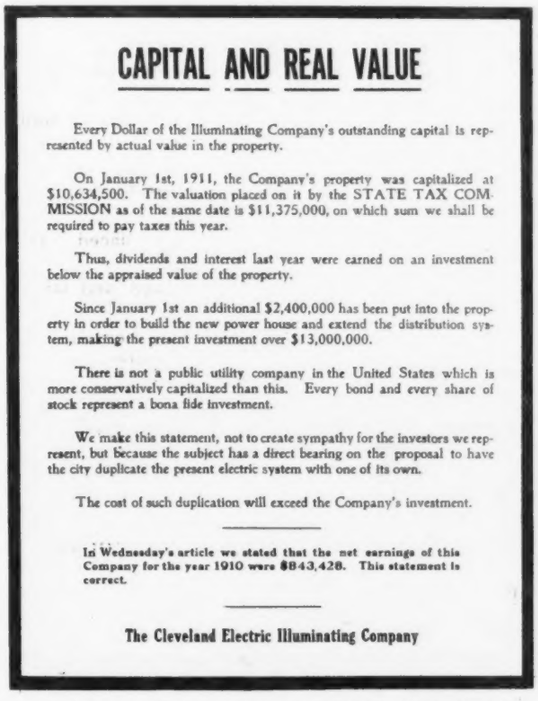
The outstanding capital on January 1st, 1911, did not exceed the cost of the property at that date.

The difference between the net earnings and the amount paid on outstanding capital, namely $173,654.00, represented the year's surplus, which was set aside to provide for contingencies.

The Cleveland Electric Illuminating Company.

Fig. 1—Reproduction of Announcement in Newspapers.

according to methods of the city officials in computing expenses. However, they are far from encouraging when



CAPITAL AND REAL VALUE

Every Dollar of the Illuminating Company's outstanding capital is represented by actual value in the property.

On January 1st, 1911, the Company's property was capitalized at $10,634,500. The valuation placed on it by the STATE TAX COMMISSION as of the same date is $11,375,000, on which sum we shall be required to pay taxes this year.

Thus, dividends and interest last year were earned on an investment below the appraised value of the property.

Since January 1st an additional $2,400,000 has been put into the property in order to build the new power house and extend the distribution system, making the present investment over $13,000,000.

There is not a public utility company in the United States which is more conservatively capitalized than this. Every bond and every share of stock represent a bona fide investment.

We make this statement, not to create sympathy for the investors we represent, but because the subject has a direct bearing on the proposal to have the city duplicate the present electric system with one of its own.

The cost of such duplication will exceed the Company's investment.

In Wednesday's article we stated that the net earnings of this Company for the year 1910 were $843,428. This statement is correct.

The Cleveland Electric Illuminating Company

Fig. 2—Reproduction of Announcement in Newspapers.

reckoned on the business basis that is used by all concerns that have money invested. Accompanying are reproductions of the first two announcements printed.

Wiring and Illumination

TUNGSTEN OUTLINING WITH LOW-VOLTAGE ROTARY-CONVERTER SET.

The Union Electric Light & Power Company, of St. Louis, is arranging to outline its new office building at Twelfth and Locusts Streets with more than 1000 low-voltage tungsten lamps. To avoid the series-multiple connection of these lamps, with its consequent overloading of remaining units, in case some circuits suffer the loss of one or more lamps, the outline lighting will be carried out on a low-voltage, three-wire system, energy for which will be supplied by a rotary converter and step-down transformers. In addition to the outline lighting a number of signs will be operated from the same low-voltage source.

LONG-HOUR FLAMING ARCS FOR DECORATIVE LIGHTING.

The Citizens' Gas & Electric Company, of Council Bluffs, Iowa, is installing forty long-hour flaming-arc lamps for the spectacular lighting of the downtown section of Council Bluffs. The lamps are being hung on shepherd-crook posts at a height of 18 ft. above the street level and are arranged in staggered relation along the street at intervals of 70 ft. between lamps. The cost of operating the lamps is defrayed as part of the general city lighting, the Council Bluffs company receiving an annual income of $95 per lamp, from which is subtracted, however, a royalty of about $10 each.

VISUAL ACUITY AND LIGHT OF DIFFERENT COLORS

BY J. S. DOW.

The article by Mr. M. Luckiesh in the *Electrical World* for Aug. 10 raises a question of considerable interest in illuminating engineering and photometry. It has often been suggested that the "power of revealing detail" of a source might be utilized to compare heterochromatic lights. And whether or not we approve of this suggestion we are bound to admit that detail revelation is a very important factor in most lighting problems, so that if there exists any great difference between different illuminants in this respect it ought to be understood and appreciated.

The writer about the year 1908 carried out a series of experiments on this point along similar lines to those followed by Mr. Luckiesh. Some of these were published in the *Electrical World** and in *The Illuminating Engineer* (London)† during 1909. In these experiments one point was brought out which seems to have an important bearing on Mr. Luckiesh's experiments, namely, the distance away of the observer. Granted that owing to the chromatic aberration of the eye the most perfect definition should be secured by monochromatic light, the question remains, which color?

I believe that it is not possible to say that light of any particular color is invariably the best for all purposes. The question is a complicated one. The peculiarities of the retina and the intensity of illumination employed affect the problem, but the most important item in the author's experience is whether near or distant vision is employed. In

*July 15, 1909.
†April, 1909.

order to illustrate this point I reproduce a diagram presented in the articles referred to.

This illustrates the results of the want of achromatism of the eye. Assuming that yellow rays are brought to a focus on the retina the violet rays will be focused in front of it and the red rays behind it. Under normal circumstances, therefore, one might suppose that the eye would accommodate itself best to yellow light and that this color, besides yielding the greatest luminous efficiency, would also yield the most perfect definition. At medium distances, when the eye is neither being forced to accommodate for a very near object nor strained to accommodate for a very distant one, and for a truly normal eye, this might possibly be the case.

But suppose that the eye is forced to undertake very near vision, say, within the minimum distance of distinct vision of 10 in. A point is soon reached when the eye-lens is unequal to further effort and the luminous image tends to be formed *behind* the retina, so that one cannot see distinctly. Now it is clear that as this image recedes the red will fall behind the retina first, then the yellow and only afterwards the violet. Consequently, it may happen that

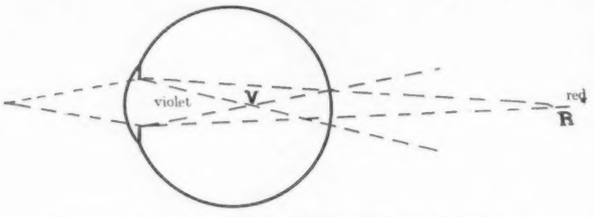


Diagram Showing Want of Achromatism of the Eye.

we can secure good definition by violet light when we have ceased to do so by light from other parts of the spectrum. This is exactly in accordance with the author's experience and that of some other people who have worked with him on this point. With a pure blue-violet light the eye can be brought to within a few inches of the object viewed without the strain of accommodation becoming noticeable. It is a fact that the green end of the spectrum is known to be excellent for securing good definition in microscope work. This is usually ascribed to certain physical phenomena connected with the optical laws of this instrument, but it has always seemed to me that the chromatic aberration of the eye might also be a potent factor.

This matter is a somewhat important one. The tendency of most people who have a difficulty in seeing fine work is to bring the eyes nearer and nearer, thus gradually straining the lens and leading to short sight. The defective vision of watchmakers and lace makers is well known. Is it possible that by using violet light the effort of accommodation and the consequences of such persistent near work might be mitigated?

Next picture what happens as the observer moves backward. A position is soon found when the eye can accommodate with perfect comfort for ordinary light—that is, mainly yellow light—and it might be presumed that in this case improved definition would be secured by using only this part of the spectrum. The red and violet ends naturally cannot be focused simultaneously with the yellow and only contribute a luminous haze. Some observers (including, I believe, Dr. Bell) find that, possibly owing to exceptionally good powers of accommodation, their eyes can adjust themselves either to red or blue, so that when a mixture of these lights is viewed they can actually see first a sharp blue object with a red haze and then a sharp red object with a blue haze.

As the distance becomes greater this effect becomes more pronounced, so that the eye oscillates between these two states. This experience, however, is not enjoyed by the author, whose eyes are slightly shortsighted. His experience is that at distances of upwards of 20 ft. it becomes more and more impossible for him to focus blue at all, while objects illuminated by red light appear more definite and sharp than even white ones would do. A glow-lamp filament seen through cobalt glass appears red with a luminous blue haze, and a line spectrum cast upon a screen appears to spread out like a fan at the blue end.

So far as the author's investigations have gone this is the general experience of people whose eyes are slightly myopic, and it can readily be understood why this should be so. Short sight means that with increasing distance a point is reached at which distant objects can no longer be clearly seen; their image is formed in front of the retina. A violet image is still further in front, so that it cannot be distinguished at all. But a *red* image might still be focused sharply and seen distinctly even when an object illuminated by white light is difficult to see.

It appears to be difficult to predict how the eyes of people wearing glasses are influenced, and this depends probably upon the success or otherwise in counteracting their optical peculiarities. When the writer exhibited an experiment illustrating the superior qualities of red rays for distant vision at a meeting of the Illuminating Engineering Society in London in 1909 the majority of the audience appeared to agree that the red light gave much the best definition. But there were also some who professed to be able to see either the blue or the red clearly, but not both together, and also a few others who could not detect much difference and thought they saw both the red and the blue equally well. There was no case of an individual declaring he saw blue best.

Bearing these facts in mind we can readily understand Mr. Luckiesh's experience that the addition of light of an unsuitable character may actually lead to objects being *less* clearly seen. It is obvious that if an eye is permanently unable to focus light of a particular kind no amount of this light, however great, would enable him to see properly. All that happens is that the rays form a luminous haze and actually constitute an impediment to vision.

In view of these considerations I was led at the time my experiments were made to believe that acuteness of vision could not conveniently be made the basis of a method of measuring the luminous intensity of heterochromatic sources. Clearly one cannot make successful use of a method according to which the value of one light might exceed the other, notwithstanding the fact that its illuminating power was thousands of times greater. In short, the power of revealing detail and the power of creating brightness are separate functions, and are better kept apart.

This, of course, is not to say that acuteness of vision by different illuminants ought not to be tested. But like the so-called "penetrating power," the photographic action of light, or its influence in destroying bacteria, it demands special tests which should not be confused with photometry.

As regards the best qualities of light for distinct vision, the conclusion would seem to be that for very near work the blue end of the spectrum would be found to be best, for moderate distances the central region and for distant objects the red end. It is conceivable that to some exceptional people the color of the light (so long as it were approximately monochromatic) would be indifferent. They, however, would not suffer by following the above suggestions, while short-sighted people who appear to find most difficulty in focusing the blue end of the spectrum at a distance would benefit.

The question as to how far it is desirable that a light should be exactly monochromatic, or whether it might not be better to aim at producing a narrow band in the spectrum so as to allow the eye a little latitude in accommodation, would also have to be considered. The band ought presumably not to be too broad, since this would mean that much of the light was indifferently focused and that definition was lost. On the other hand, restricting the wave-length of the light within too narrow limits might

conceivably prove inconvenient because it might mean that a slight fluctuation in the accommodation of the eye would at once make the image indistinct.

COMBINATION LAMP-POST DRINKING FOUNTAINS AT DUBUQUE, IA.

At a number of street intersections in Dubuque, Ia., the city government has erected combination sanitary drinking fountains and lamp-posts of the type pictured here-

Combination Drinking Fountain and Tungsten-Lamp Post.

with. Eight of these combination fixtures have already been placed, six of which were made up by a local manufacturer, through the adaptation of existing cast-iron parts. The post carries a 150-watt tungsten lamp inclosed in a 12-in. frosted globe, 8 ft. above the sidewalk. The fountain is arranged for four outlets, two of which are equipped with continuous-flow sanitary drinking cups. The post fountains complete cost $80 each. The post lamps are maintained by the city as part of the street lighting and cost $10 a year for energy. The single lamps are switched on and off night and morning by the policemen patroling these respective beats.

RECENT TELEPHONE PATENTS.

REPEATING CIRCUIT.

Ever since the discovery of the principle of the microphone telephone repeater there has been a struggle to adapt it to operation in two directions. For operation in one direction only, that is, for transmitting one-half a conversation, the apparatus is ideally simple. As soon, however, as two repeating elements are combined to form a complete conversation circuit the trouble begins. This arises in the neutral interference and singing of the combination. Most attempts to overcome this have been mere circuit arrangements based upon so associating the apparatus that the interference would be eliminated through differential action. Mr. C. E. Lanning, of Boston, brings forth an entirely different idea. He adheres to the old simple one-way principle, but arranges a switching relay for reversing its relation to the line automatically, with a reversal of the origination of transmission. The control relay operates in response to the received transmission through the repulsive action of a varying field caused by the voice current upon a copper block or other similar means. Other suggested arrangements comprise two repeaters at opposite poles, but one of which is in transmitting connection at a time.

SWITCHBOARD CIRCUITS.

There are to-day several types of switchboard-circuit systems for common-battery working in which the cord circuit is practically free from relays. Such systems were, however, not common at the date of invention of a patent granted to H. P. Claussen, of Chicago. In this system, which is of the three-wire type, all relays are associated with the various jack circuits, while the supervisory lamps are wired to the plug sleeves and to ground. The relays serve to supply battery connection to the jack sleeve and thus to the plug sleeve wherever the conditions demand the glowing of the lamp. The Stromberg-Carlson Telephone Manufacturing Company is assigned this patent.

Mr. A. H. Dyson, of Chicago, has obtained two patents for a trunking system, in which provision is made for the "A" or outgoing operator to control the connection. In other words, complete disconnection and supervision are provided. The trunks are adapted to operate in connection with two of the commercial switchboard circuits. These patents are also assigned to the Stromberg company.

SELECTIVE SIGNALING.

Most selective-signaling systems which depend upon the use of currents of different frequency are of the harmonic type. Each bell is therefore tuned to respond to a certain frequency, vibration being set up in a bell only when the native vibration period of its moving system accords with the frequency of the current. In the system herein under consideration selection is accomplished by electrical tuning. The bell windings are so arranged and proportioned that none but the specified frequency will produce any effect. This is accomplished by using two windings, one connected to each limb of the line, and by adding condensers and coils in such manner that neutralizing effects will be obtained from any frequency save the one corresponding to that of the bell.

FLEXIBLE MOUTHPIECE.

Mr. G. A. Duryee, of New York City, has patented a yielding-transmitter mouthpiece that no sound of the voice may escape and be overheard. The mouthpiece is mounted within a tube which is shaped to fit the face. The mouthpiece is shaped to fit the lips and it is permitted a forward and back motion, being positioned normally by tension springs.

COMPOSITE SYSTEM.

A patent granted to C. L. Bopp, of Meers, S. D., describes a composite system for two simultaneous telegraph circuits and one telephone. One of the telegraph circuits uses pulverized relays subject to high-potential condenser kicks.

LETTER TO THE EDITOR.

Value and Depreciation.

To the Editor of Electrical World:

SIR:—I have read with interest the discussion on depreciation in your issue of Aug. 5 by Mr. H. G. D. Nutting and also the criticism by Mr. W. A. Del Mar in the issue of Sept. 23. It seems to the writer that both the gentlemen are a little mixed up on the economic laws of value, price and money.

The value of a commodity can only be measured by the efforts which society makes in its production; or, in other words, the value of a commodity can only be measured by the quantity of labor necessary to produce it.

The price of a commodity is determined by its value and the unknown ratio of supply and demand. The conditions may be discussed from the following formula which I will attempt to give:

Let V = value, S = supply, d = demand and p = price. Then

$$p = V \frac{f(d)}{f(s)}$$

When

$$d < S \quad p < V$$
$$d = S \quad p = V$$
$$d > S \quad p > V$$

But in the long run the average of $\frac{f(d)}{f(s)}$ is unity; therefore, in the long run the average price is equal to the value. There would have been no objection to Mr. Nutting's method in using dollars as a measure of value if it were not for the fact that money standards (the most common of which is gold) are also commodities and their value varies with the conditions of their production.

Brooklyn, N. Y. BENJAMIN HOLAND.

Three-Wire Balancers.

To the Editor of Electrical World:

SIR:—The article by Mr. George T. Hanchett on "Three-Wire Balancers," which appeared in your issue of Sept. 9, explains very clearly the action of balancer coils and analyzes the flow of current in the various paths. The writer had occasion at one time to take up a study of this question and used a three-element oscillograph in order to obtain evidence regarding the distribution of the currents.

Two of the vibrators of the instrument were connected in series with the balancer coil, one vibrator being at each end of the coil, while the third vibrator was connected across the terminals of the coil so as to show the pressures impressed on it. The accompanying curves do not show the exact time phase of the currents and pressures, as the beams of light were not focused on the same point of the film.

The conditions existing with balanced load on the three-wire system are indicated by the curves in Fig. 1. The only current flowing in the balancer coil is a small exciting current, which is alternating in character, as shown by curves *a* and *b*. The pressure impressed on the coil is of the sine form, as shown by curve *c*.

When the load on the system becomes unbalanced a direct current is superposed on the alternating exciting current in the balancer coil, thus giving a resultant pulsating direct-current, as shown by curves *a* and *b*, Fig. 2, the pressure

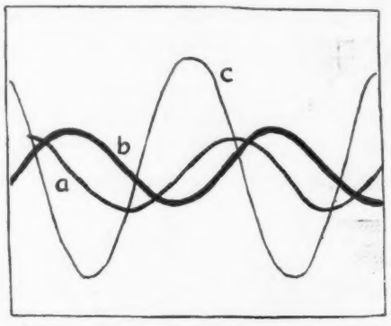


Fig. 1—Tracing from Oscillograph Record with Balanced Load.

curve being represented by *c*, as before. The curves were obtained from balancer coils with an air core and of small current capacity, and therefore the effect of the exciting current is very much greater than it would be with balancer coils used in commercial work.

It is true that the neutral point cannot be shifted by shifting the point at which the neutral is connected to one end of the balancing coil, but the pulsating emf obtained between the neutral and either outside wire will have an

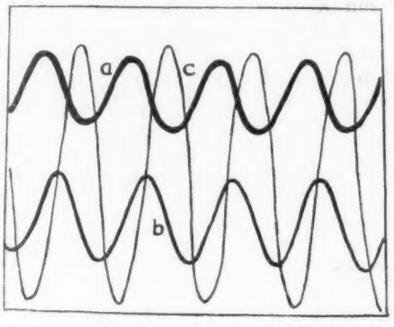


Fig. 2—Tracing from Oscillograph Record with Unbalanced Load.

effective value somewhat greater than half the total pressure between the outside line wires, though the average value will be just one-half.

Scranton, Pa. A. R. DENNINGTON.

Digest of Current Electrical Literature

ABSTRACTS OF THE IMPORTANT ARTICLES APPEARING IN THE ELECTRICAL PERIODICAL PRESS OF THE WORLD

Generators, Motors and Transformers.

Homopolar Turbo-Generator.—An illustrated description of a 50-kw, 100-volt, direct-current homopolar turbo-generator at the present Olympia Electrical Exposition in London. Fig. 1 shows a section (not to scale) through the machine on the center line. The magnetic circuit is double, *aa* and *bb* being the two portions, each of which forms one end pole. Each pole extends completely round the armature with no change of sign. There is thus no iron loss. *R* is the rotating part or armature; *M* is the fixed part or frame. *EE'* are the exciting coils, which are placed directly round each air-gap, so that the leakage is reduced to a negligible figure. The smallness of the gap is limited only by mechanical considerations, consequently the field copper loss is small. The conductors *C*, in which the volts are generated, lie in micanite tubes in tunnels in the armature, under the central pole, and are connected at each end to slip rings *D*, from which the current is collected. The rotor has a strong steel shaft *S* and a high-permeability steel core *P*. On this are mounted the slip rings *D* and also the rings *GG* forming the end poles. In the diagram the center pole of the rotor is shown solid with the core and the end poles are solid rings. While this is not necessary electrically, it is sometimes convenient mechanically to build these up of laminations. Bolts *B* pass from one end of the rotor to the other and are insulated by mica tubes, like the armature conductors, and hold the slip-rings and pole-rings solidly in position. There are mica washers between the rings; thus, mica is the only insulating material used in the rotor. The rotor has a periphery of great strength, and it is claimed that the construction adopted renders the machine mechanically sound. The frame *M* of the machine consists of three castings, a large one comprising the central pole and the yokes and two smaller ones

forming the end poles and carrying the bearing brackets. The frame carries stationary conductors, which connect the armature conductors in series. The slip-rings are grooved and in the grooves lie the brushes *AA* (Fig. 2), which consist of a flexible copper core wound with an armoring. The latter, though slightly diminishing the flexibility, both protects the core from wear and is found by experience to make a better contact with the slip-ring than any other form of brush. The brush is held in place round the ring by springs *BB*, the tension of which is regulated by the screw and nut *K*, while the current is led away by the flexible leads *L* to the stationary conductors. Appended are the leading dimensions and particulars of the machine, from which it will be seen that it is of compact size. The shortage of the distance between bearings is pointed and should lead to freedom from vibration troubles. The machine gives 50 kw at 100 volts, 500 amp, 3500 r.p.m.—Supplement to Lond. *Electrician*, Sept. 22.

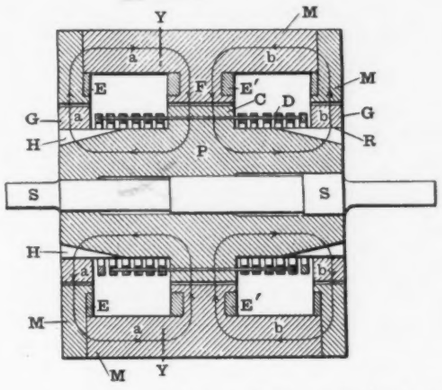
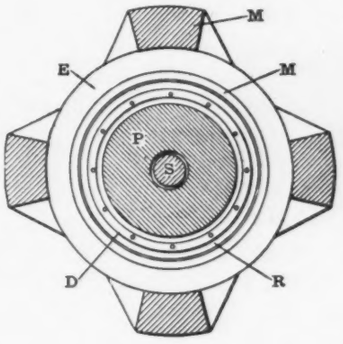


Fig. 1—Sections Through Homopolar Generator.



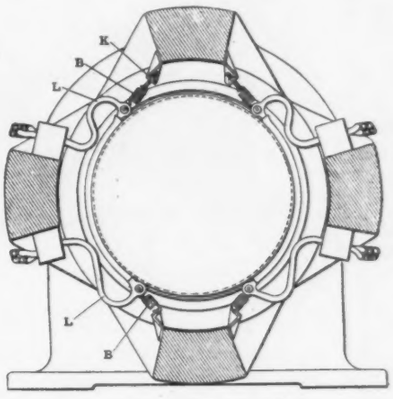


Fig. 2—View of Brushes.

Total length between bearings, inches	29.5
Height of frame, inches	28.25
Width of frame, inches	28.0
Diameter of rotor, inches	14.25
Peripheral velocity, feet per minute	12,800
Field amperes,	5
Number of conductors	12
Width of each slip-ring, inches	0.5
Length axially of center pole, inches	6.0
Length of each end pole, inches	3.5

Rectifier.—An illustrated description of a vibrating rectifier of British make for charging small batteries from alternating-current mains. The apparatus consists essentially of a transformer with a vibrating contact. A stray magnetic field of the transformer operates the armature and contact system of the rectifier at the zero points of the alternating-current curve, producing a rectified current. By this system of operating the vibratory contacts by the transformer field perfectly synchronous working can be adjusted by mechanical means, such as small brakes, springs, etc., without the use of auxiliary apparatus. The efficiency on load and on open circuit corresponds to that of transformers of similar output. The unidirectional current produced is suitable for charging accumulators, for lamps and other non-inductive applications, and with the addition of condensers it can also be used for inductive loads such as small motors, etc.—Lond. *Elec. Eng'ing*, Sept. 21.

Alternators.—J. REZELMAN.—The author has formerly shown the existence of secondary currents induced by the external coils of an alternator. In the present article the author gives an investigation of these currents and their effects.—*La Lumière Elec.*, Sept. 23.

Lamps and Lighting.

Specific Consumption of 0.8 Watt per Hefner Candle-Power.—The larger osram lamps ("osram intensive lamps" of from 100 cp to 1000 cp, which are competing with arc lamps) are now being built for lower specific power consumption, namely, 0.8 watt per hefner candle-power. This consumption is claimed for lamps for 100 volts to 160 volts with outputs of 200 cp, or 400 cp, or 600 cp, or 1000 cp, while lamps for 200 volts to 260 volts with an output of 200 cp, 400 cp, 600 cp or 1000 cp are made for a specific consumption of 1 watt per hefner. The prices of these lamps have also been reduced (the cost of a 200-hefner-cp lamp being now $1.88, of a 600-cp lamp $4, of a 1000-cp lamp $5.50), and tables are given showing what savings can be obtained if arc lamps are replaced by osram incandescent lamps. Four 110-volt lamps were tested in the Reischsanstalt, the test beginning with a consumption of from 0.83 watt to 0.87 watt per hefner candle of mean candle-power in a plane perpendicular to the axis of the lamp. The lamps were tested for 1000 hours. In all of them the candle-power decreased somewhat, the average being 8 per cent in 1000 hours. The record for one of the lamps is as follows, the voltage being maintained constant at 110.5:

Hours.	Amperes.	Mean Hefner Candle-Power in a Plane Perpendicular to Axis of Lamp.	Specific Consumption in Watts per Hefner Candle-Power.
0.2	3.16	410	0.85
100	3.21	407	0.87
200	3.21	402	0.88
400	3.19	392	0.90
600	3.17	394	0.89
800	3.16	396	0.88
1000	3.13	380	0.91

(While it is not stated, it is known that a ductile tungsten filament is now being used in the osram lamp.)—From a bulletin of Deutsche Gasglühlicht A. G. (German Welsbach Company), Berlin.

Portable Photometer.—An illustrated description of a simple portable photometer made by a British company under the name "luxometer." The principle is similar to that of the Trotter photometer, but the parts are differently arranged. A screen illuminated by a standard lamp within the instrument is viewed at an angle which can be varied till the effect balances that of a fixed external screen illuminated by the source to be photometered, and the result is read off directly from the pointer attached to the head by which the internal screen is rotated. The compactness of the apparatus is illustrated in Fig. 3, which shows the complete outfit, including the luxometer *C* itself, the battery *S* supplying energy to the standard lamp and the daylight attachment *B*, the use of which is mentioned below. The weight is only 1.75 lb. When in use the instrument is held in the hand, no stand or other support being required. Candle-power as well as illumination measurements can readily be made and the surface bright-

ness or intrinsic brilliancy of any surface can be instantly measured by viewing it through the instrument instead of the fixed screen *A*. For this purpose a simple attachment can be provided, whereby what is spoken of as the "win-

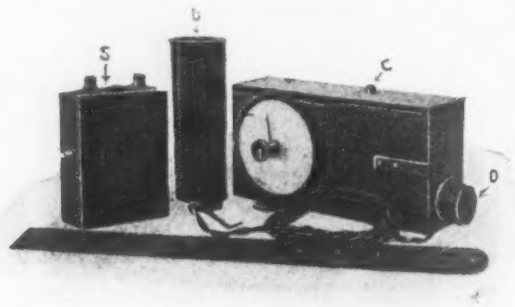


Fig. 3—Luxometer Outfit Complete.

dow efficiency" of a room can be determined. Merely to state that the illumination observed in a certain room lit by daylight is so many ft.-candles is meaningless, depending, as it does, entirely upon the state of the sky. By means of this attachment, on the other hand, a definite figure can be obtained for the ratio of the actual illumination at any particular point in the room to the daylight illumination outside. The value of the daylight outside is for this purpose measured by attaching the daylight tube, which is so proportioned that the illumination from one-thousandth part of the hemisphere of the sky reaches the instrument, the instrument being pointed at the clear sky. In order to simplify the adjustment a yellow-tinted external screen is provided and should be used in place of the white screen when daylight observations are being made. By this means the color of the daylight illumination is reduced to something near that of the standard lamp inside the instrument, so that an accurate balance is easily obtained.—Lond. *Elec. Eng'ing,* Sept. 21.

White Light from Mercury Arc.—E. Darmois and M. LeBlanc, Jr.—A critical discussion of the different methods for improving the spectrum of the mercury arc so as to superpose red rays on it. If this is done by means of an incandescent lamp the efficiency is decreased. The use of amalgam tubes has not passed the laboratory stage. On the other hand, the use of fluorescent screens seems a satisfactory solution of the problem. A fluorescent screen may be considered as a light transformer; excited by certain radiations it emits rays which are transformed toward the red part of the spectrum. The problem involved was to get a suitable fluorescent substance, and this has been solved by Dr. Peter Cooper Hewitt.—*La Lumière Elec.,* Sept. 23.

Ultra-Violet Rays from Mercury-Arc Lamps.—V. Henri.—The author has studied the variation of the ultra-violet radiation from a mercury-vapor lamp with the conditions of cooling of the tube. He finds that the ultra-violet radiation is the more intense the higher the temperature of the luminous tube. In principle if the tube is cooled with water ultra-violet radiation is only one-fourteenth as strong as in the case of the lamp being lighted in free air, while consuming the same number of watts. The ultra-violet light efficiency of a lamp seems to depend not on the number of watts consumed, but on the potential drop in the luminous tube. As to the constancy of the ultra-violet light radiation during life, it seems that for the purposes of photographic and other applications of ultra-violet rays the mercury-vapor quartz lamp is a rather constant source of rays, and the radiation depends on the voltage, the amperes and the length of the tube.—*Comptes Rendus,* Aug. 14; *La Lumière Elec.,* Sept. 23.

Hygienic Effects of Gas and Electric Light.—K. Schlesinger.—The first part of an article in which the author first refutes the arguments of gas engineers concerning the superior hygienic properties of gas over electric light. The criterion must be the effect of gas and electric light on the condition of the air in the room, and in this respect the carbon-dioxide content in the air is really of smaller importance than the temperature and humidity in the air. While the temperature increases much more rapidly with gas than with electric light, gas light increases humidity and electric light decreases humidity. The decrease of humidity due to electric light may be considered as compensation for the small increase of temperature due to it, while gas light has two serious disadvantages together, a high increase of temperature and also an increase of humidity. The paper is to be concluded.—*Elek. Zeit.,* Sept. 21.

Metallic-Filament Lamp.—A note on a recent British patent (24,637, Sept. 14, 1911) of the Westinghouse Metallfaden Glühlampenfabrik G. m. b. H. (Austria). After the decarbonizing process filaments containing traces of carbon are purified in hermetically sealed vessels, in which a high degree of exhaustion is produced by a vacuum pump. The vessel is heated to a temperature of from 1200 deg. C. to 1300 deg. C. until all the carbon is eliminated.—Lond. *Elec. Eng'ing,* Sept. 21.

Supporting Wires for Metallic Filaments.—A note on a recent British patent (23,404, Sept. 14, 1911) of A. Mond. The supporting wires are made of thin nickel or carbon and are covered with a layer of chromium compound, which is then heated to incandescence by a current and decomposed into an oxide of chromium.—Lond. *Elec. Eng'ing,* Sept. 21.

Power-House Lighting.—C. E. Clewell.—An article on the best methods of power-house lighting so that all parts of the machines may be readily seen with as few shadows as possible. The author discusses the arrangement of the lighting system of a certain power house, with special reference to the use of 250-watt tungsten lamps in the engine-room.—*Elec. Journal,* September.

Light Production.—R. A. Houston.—In a continuation of his long illustrated serial on the principles of light production the author discusses flames.—Lond. *Electrician,* Sept. 22.

Generation, Transmission and Distribution.

Homo-polar Gyrostat.—An illustrated description of an exhibit at the present Olympia Electric Exposition in London. Electric driving of gyrostats at high speeds becomes very simple if the gyrostat wheel is made the rotor of a homopolar motor, a couple of slip-rings being then the only electrical connection. There are two ways of doing this. In the first the gyrostat wheel is absolutely simple, without any insulation; it is indicated at *A* in Fig. 4. The stationary poles *C* are produced in the casing by two annular windings *B*. Current is led in and out of the flywheel by flexible cord brushes *E,* which lie in the grooves *D*. If

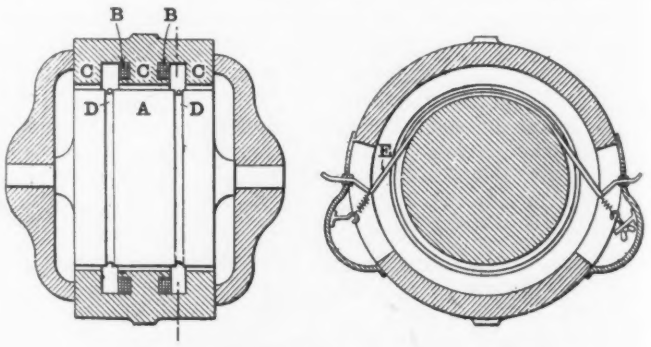


Fig. 4—Gyrostat with a Simple Flywheel.

preferred, one brush may bear on the periphery of the flywheel and the other on the shaft or transmission. In Fig. 5 the arrangement is such that the flywheel carries the magnetizing coil *B* and the current to this is supplied by a

brush running in the groove *A* (one end of the coil being earthed to the wheel) and a second brush running on a slip-ring *C*, to which the other end of the coil is connected. The coil is preferably wound as a volute with flat copper strip, the broad faces of the strip being in contact so that the centrifugal force has no tendency to cut insulation or to force any part of the coil on sideways. The flywheel is shown as in one piece, but it is preferably built up of different qualities of steel, that of high-tensile strength being used where strength is important, whereas a ring of high-permeability iron is used where necessary for the magnetic current. The outer casing shown in Fig. 5 is fitted to enable a vacuum to be obtained; it has no electrical use, so that the whole motor revolves, excepting only the brushes. —Lond. *Electrician*, Sept. 22.

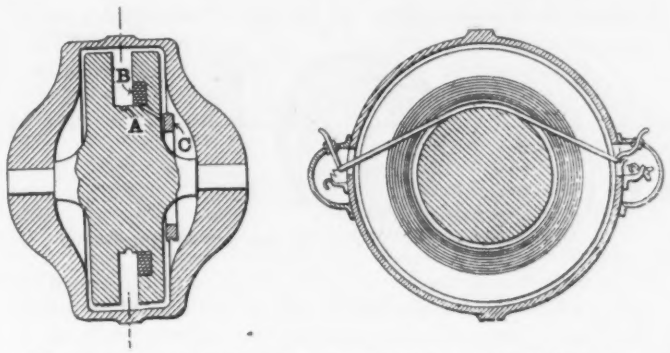


Fig. 5—Gyrostat with Flywheel Carrying a Magnetizing Coil.

Effect of Starting Currents on Motor Circuits.—J. W. Fox.—An article in which the author gives in two diagrams the records of power consumption of two cotton mills driven by squirrel-cage induction motors. They show that the current during the starting periods does not materially exceed the current drawn from the line for normal operation. The author shows why this must be so, at least if the different motors have a rating of 10 per cent each of the total equipment of the mill. The worst conditions in starting are, of course, with the last motors. But even if the last two motors, each demanding 25 per cent to 35 per cent of the normal operating current for the mill, were to be started at the same instant the total current required would only slightly exceed the total current demanded to operate the mill under normal conditions. The author's final conclusion is that the prejudice in the minds of many electric-supply companies against the use of squirrel-cage motors on account of starting difficulties is largely unfounded.—*Elec. Journal*, September.

Installations, Systems and Appliances.

Electric Heating and Cooking Apparatus.—A. STEINHARDT.—The conclusion of his paper illustrated by numerous diagrams. Details are given of the construction of various electric-heating and cooking apparatus. A distinction is made between designs using tubes and plates as heating elements, and the difference between direct and indirect heating is also emphasized.—*Elek. Zeit.*, Sept. 21.

Wires, Wiring and Conduits.

Extensible Steel Mast.—An illustrated description of an extensible steel mast of novel design, invented by A. Siewert. A four-sided hollow mast is formed of four flexible steel strips (Fig. 6). The edges of these strips have teeth cut in them in such a way that the teeth of one strip interlock with the recesses of the adjoining one, so as to join the four strips at their edges. The teeth project to some extent. This makes up a hollow column, and it remains to brace it. For this purpose thin sheet-steel brace plates are placed at frequent intervals. The mechanism for raising or expanding a mast of this kind is seen in Fig. 7, illustrating a four-sided section. The steel strips are wound upon the drums *AA* and on two corresponding drums placed in the front and rear. A second set of drums *B* is mounted below to feed out the strip and guide it properly. These latter drums have projecting teeth around the center, which engage in holes in the steel band. A chain drive connects both drums and the lower or feeding rollers are driven by a hand crank or in other cases by an electric motor. As the four steel bands pass up through the guide plate *D* they become interlocked and form the steel tube. Upon the guide plate is a pile of section disks *E*. The top head of the mast *F* carries the first of a set of links which go to join all the section plates. When the head *F* rises in the first place it picks up the first section disk by means of the first four links placed on the four sides, so that the disk is automatically fitted around the column. As the mast continues to rise the second disk is taken along in the same way; the result is that the section disks are situated all along the mast, their spacing depending on the length of the link, which is determined according to circumstances.—Lond. *Electrician*, Sept. 22.

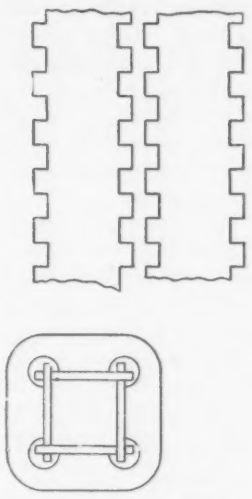


Fig. 6—Toothed Strip and Brass Plates.

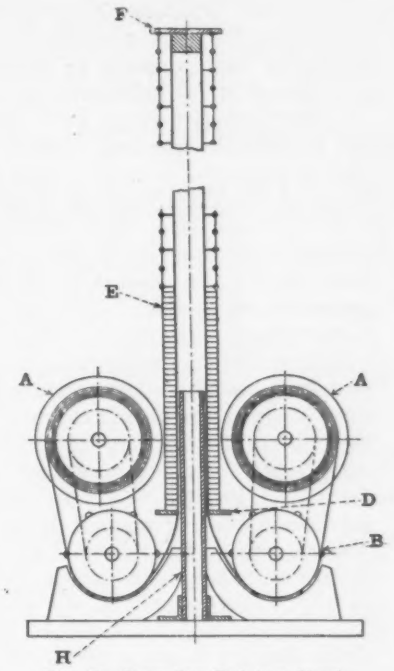


Fig. 7—Gear for Raising Mast.

Electrophysics and Magnetism.

Homogeneous Röntgen Radiation.— C. A. SADLER.—An account of an experimental investigation of the transformation of the energy of homogeneous Röntgen radiation into energy of corpuscular radiation. Perhaps the most interesting result is that a very close connection exists between the emission of corpuscular radiation and the production of Röntgen radiation of the homogeneous type in the case of the group of elements Cr—Ag. This is in entire agreement with the supposition advanced by various investigators that the production of Röntgen radiation is always accompanied by the emission of negative corpuscles. *Phil. Mag.*, September.

Disintegration Products of Uranium.—G. N. ANTONOFF. —An account of an experimental investigation; the chief results are summed up as follows: A product called UrY with a period of 1.5 days is always present in small quantities in uranium. It emits soft beta rays with an absorption coefficient $\mu = 300\ (cm)^{-1}$ and probably also some alpha rays. The experimental results indicate that UrY is a lateral disintegration product of uranium and is produced in small quantity compared with UrX.—*Phil Mag.*, September.

Transient Phenomena in Overhead Lines and Cables.— K. W. WAGNER.—A mathematical paper in which the author describes a method for experimentally investigating the transient electromagnetic phenomena in overhead lines

and cables. The method is essentially based on replacing the circuit under test by another circuit in which the transient phenomena occur in an otherwise identical way, but at so much less speed that they can be studied by the oscillograph. Applications of this method to the plotting of current and emf curves show agreement between theory and experiment.—*Elek. Zeit.*, Sept. 7, 14, 21.

Units, Measurements and Instruments.

Insulation-Resistance Tests.—W. A. Toppin.—The author thinks that the present tendency in the design of insulation-resistance testing sets is to render them less efficient than the apparatus manufactured several years ago. The use of small batteries to obtain the required testing pressure has become obsolete and a small permanent-magnet, hand-driven generator is now universally used. These used to be powerful little machines contained in a separate box from the ohmmeter, but in order to produce a lighter and cheaper apparatus the generator is now being put in the same case as the ohmmeter. Therefore, the weight of the generator was reduced and it became less powerful. The author gives comparative curves of the pressures obtained with two similar machines made by the same firm, one ten years ago and the other recently. There is a marked contrast between the pressures obtained when testing low-insulation resistances, the pressures with the recent machine being much lower. The author emphasizes that although there is a greater need for high pressure when testing doubtful wiring or plant it is just in these cases that the modern testing set fails. When testing lighting installations with a large number of points or motors with complicated switch gear it is not often that a result of more than 500,000 ohms is obtained, and thus the pressure at which the test is made is too low to be of much value.—Lond. *Elec. Review*, Sept. 22.

Telegraphy, Telephony and Signals.

Wireless Telephone Transmitter.—W. Dubilier.—An illustrated description of an improved wireless-telephone transmitter in which much heavier currents can be used than in the usual type of transmitter. It is a combination of a double-diaphragm transmitter with the principle of controlling the diaphragm by magnetic means instead of by the voice direct. The construction is shown in Fig. 8.

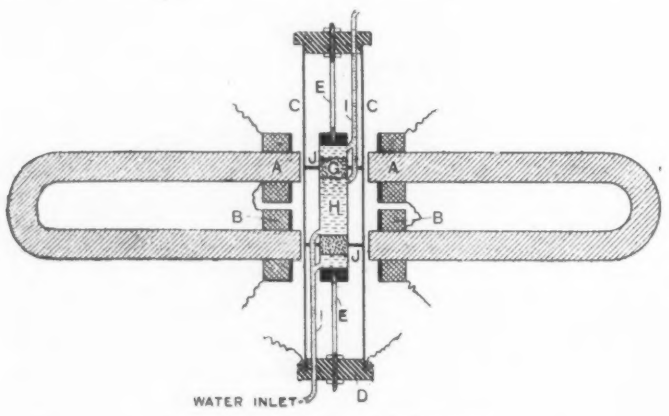


Fig. 8—Section of Transmitter.

The transmitter complete consists of the magnets *A, A*, wound with the 2-ohm windings *B, B* and placed opposite to each other with the diaphragm and carbon-containing cup between. The diaphragms are approximately 5 in. in diameter and 1/28 in. thick. The ebonite disk *D* is used to mount the diaphragms on and is drilled with large-sized holes so as to prevent "air packing" or talking against one another. A cross-section view of the carbon-containing cup is shown in Fig. 9. It resembles three brass rings placed within one another, forming three independent containing portions. Water circulates through the chambers *F* and *H* by means of the inlet and outlet tubes *I*, and the middle chamber *G* is used to retain the carbon granules. To make contact with the granular mass use is made of circular rings of platinum, *J, J*, which are first soldered to the diaphragms *C, C*. The platinum rings are drills with small holes round the entire circumference, so as to allow a free circulation of air, and through one of these holes the small inlet and outlet tubes are run. The contact is made in the center of the granular mass. A mica disk is used to retain the granules in the chamber. A local transmitter is connected in series with a set of dry cells and the windings

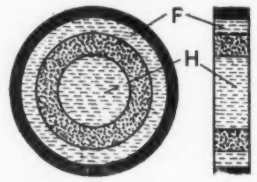


Fig. 9—Cross-Section of Carbon-Containing Cup.

B. Leads are taken from the diaphragms to the aerial circuit. When the transmitter is spoken into the current flowing round the windings varies the magnetic pull of the magnets in the usual manner and the diaphragms *C, C* are set in vibration to the same proportion. The maximum vibration should be figured as the resultant of the two; that is, for the sake of illustration, consider that the maximum vibration of each diaphragm is 1/16 in., the result would be equivalent to 1/8 in., for each diaphragm works oppositely in the same proportion. In actual practice this transmitter (although difficult to construct or adjust) gives the desired results and comes near to being the ideal transmitter for heavy currents. This transmitter has also been used successfully as a telephonic relay.—Lond. *Electrician*, Sept. 22.

Miscellaneous.

Insulating Compound.—A note on a recent British patent (176, Sept. 14, 1911) of the British Thomson-Houston Company (General Electric Company of this country). A drying oil, such as linseed oil, is heated with waste rubber until a temperature is reached at which an exothermic reaction takes place, when a cement is produced. After cooling this can be thinned by mixing it with asbestos and sulphur, then pressing it and finally vulcanizing the compressed mass.—Lond. *Elec. Eng'ing*, Sept. 21.

Book Reviews.

The Propagation of Electric Currents in Telephone and Telegraph Conductors. By J. A. Fleming. New York: D. Van Nostrand Company. 316 pages, 81 illus. Price, $3.

This volume will be welcomed by students of contemporary physics as well as by engineers of telephone exchanges and telegraph companies. The general phenomena due to the transmission of electric impulses over air lines and submerged cables are described in several chapters in which the presentation of the subject is clear and comprehensive. Many chapters are devoted to the theory of such transmission and no excuse is given for the introduction from the start of vector analysis, Fourier's theorem and differential equations. It is rightly assumed that a student who has not at least the mathematical equipment which these imply had better leave the theory alone.

Frequent reference is made to the papers of Dr. Kennelly, of Harvard, on the propagation of electric currents along telephone cables and considerable space is given to the masterly investigation of Professor Pupin, of Columbia, on the properties of loaded cables. On page 47 a list of works on modern electric theory is given from which those of Sir Oliver Lodge are omitted; possibly because they are so well known as not to need mention.

Hendricks' Commercial Register. Twentieth annual edition. New York: Samuel E. Hendricks Company. 1419 pages. Price, $10.

The twentieth annual edition of this invaluable commercial directory is enlarged over the previous edition by seventy-seven pages, or, allowing for matter omitted from the new edition, contains 124 pages of new matter, including nine additional classification index pages, representing over 3000 new classifications. The total number of classifications is now over 45,000, corresponding to 350,000 names and addresses in every branch of mechanical and electrical engineering and kindred professions and trades.

Electric Traction and Transmission Engineering. By Samuel Sheldon and Erich Hausmann. New York: D. Van Nostrand Company, 1911. 307 pages, 127 illus. Price, $2.50.

The purport of this work is stated in the preface to be to present a perspective view of the design of a complete railway installation, from the cars to the power station, as also to indicate the nature and sequence of the various entailed problems and to suggest methods for their solution. Many who will use this handbook otherwise than as a textbook will probably regret that answers are not given to the numerical questions appended to each chapter.

New Apparatus and Appliances

EXHIBITS AT THE ELECTRICAL EXPOSITION OF 1911.

A news account is published elsewhere in this issue of the features of the Electrical Exposition of 1911 which is being held in the new Grand Central Palace, Lexington Avenue, New York City, Oct. 11 to 21 inclusive. We append herewith brief notes on some of the most interesting exhibits at the show.

Campbell Electric Company, Lynn, Mass., shows a complete line of electromedical apparatus, as well as transformers, ozone generators, transformers for bell-ringing circuits and thermo flashers and time switches.

Edison Storage Battery Company, Orange, N. J., has a complete exhibit of its various sized cells, in addition to a small generating outfit and battery for resident service.

Electric Controller & Manufacturing Company, Cleveland, Ohio, makes a display of automatic motor starters and controllers. The apparatus is shown in operation in connection with a motor-driven pump.

Electric Storage Battery Company, Philadelphia, Pa., has an interesting exhibit of its various types of cells. The company also is demonstrating apparatus for gas-car illumination, for railway lighting and signaling and for vehicles.

Electrical Testing Laboratories, New York, are demonstrating methods used in analyzing and testing papers. Included in the display are machines for bursting strength, weight per ream, ash-weighing scales, etc.

Federal Sign System, Electric, Chicago, Ill., has a display of Federal vacuum cleaners, Willis straight-line wattmeter and a number of sample signs.

General Electric Company has an unusually large display of motors, arc lamps, theatrical lamps and a variety of household appliances.

General Vehicle Company, Long Island City, is making exhibit of a 2000-lb standard express-type body wagon and a 700-lb. standard wagon, in addition to a charging set for commercial vehicle work.

Gould Storage Battery Company, New York, exhibits parts as well as complete batteries of a type used in the crosstown railway lines in New York City.

Haskins Glass Company, Wheeling, W. Va., has arranged a display of "Lucida" reflectors, "Linticular" reflectors and a line of cut glassware. The company also manufactures insulators for high-tension work.

Habirshaw Wire Company, New York, exhibits panels containing sample rubber-covered wire and heavy conduit cables.

The Holophane Company, Newark, Ohio, has a tastefully arranged booth in which it displays glassware for residence, commercial and industrial lighting. Reflectors of glass and steel are shown in a great number of varieties.

Hughes Electric Heating Company, Chicago, Ill., is making a demonstration of its ranges, ovens, warmers and toasters. The devices are in all sizes, from a single heating unit to a range suitable for hotels and restaurants.

Hurley Machine Company, Chicago, has a working exhibit of laundry machines of many types, all of which are driven by motors.

Jefferson Glass Company, Follanbee, W. Va., displays a full line of "Luceo" illuminating glassware, including indirect lighting dishes.

Kinetic Engineering Company, Philadelphia, Pa., shows two types of blowers, one for pipe-organ attachment and the other for piano attachment.

National Electric Lamp Association, Cleveland, Ohio, features a 3000-watt cluster, consisting of six 500-watt, frosted, drawn-wire tungsten lamps hung beneath an 8-ft. steel reflector. Samples of its complete lines of lamps are shown in bases.

The Opalux Company, New York, manufacturer of glassware designed to kill dazzling lighting effects, has a line of wide, medium and narrow reflectors on exhibition.

Pyrene Manufacturing Company, New York, demonstrates the efficiency of its fire-extinguishing compound and also its insulating qualities. Small electric arcs are extinguished and bare-copper conductor feeding lamps are immersed in the liquid.

St. John Corporation, New York, distributor of the Rollinson electrical specialties, has a display of transformers for bell-ringing and other low-voltage circuits, in addition to a line of meters, load boxes or testing sets.

Shelton Electric Company, New York, is demonstrating its well-known lines of vibrators, hair dryers and therapeutic machines.

Simplex Electric Heating Company, Cambridge, Mass., has a complete line of its heating devices, including flatirons, stoves, toasters, pads, etc., on exhibition.

Watson-Stillman Company, New York, shows a turbine pump for use in loft buildings and apartment houses. Tanks of water are used in connection with the demonstration of the pump and of the tank switches.

Westinghouse Electric & Manufacturing Company, as well as Westinghouse Lamp Company, show a complete line of their products. The manufacturing company features a line of improved direct-current motors with various forms of control apparatus, in addition to a line of meters; while the lamp company has a complete display of its tungsten lamps.

Weston Electrical Instrument Company, Newark, N. J., has a rather complete line of standard instruments on display. These include instruments of precision as well as those intended for switchboard and portable use.

A TWO-VOLT DRY BATTERY.

A new dry cell recently developed and marketed by the Efficiency Electric Company, 4524 Lincoln Avenue, Chicago, is declared by the manufacturer to be the only two-volt dry battery made, besides embodying unusual features of long life and complete recuperation after apparent exhaustion. In energy output one of these cells is claimed to be the equal of eight of the average dry batteries. In a test reported by the makers one of the Star dry cells rang a bell continuously for eight weeks, being allowed only four-minute intervals for recuperation every two weeks. After another short rest, it is said, the same battery will be capable of ringing the bell for another period of six weeks or more. As a primary cell for furnishing energy to small lamps one of these batteries connected to a 2-volt, 2-cp tungsten lamp is said to have kept the lamp alight for an initial continuous period of 24 hours, followed by two similar 24-hour periods after the cell had been allowed to rest. The cells are made in three sizes—4 in. x 2 in., 6 in. x 2.5 in. and 8 in. x 4 in.

NEW ELECTRIC STOVE.

The Hughes Electric Heating Company, of 226 West Superior Street, Chicago, is making a new electric cook-stove of the type shown in the illustration. This stove stands 60 in. high over all and is 52 in. wide and 21 in. deep. It has four "griddle" heaters and an oven 18 in. x 18 in. x 12 in. Above this oven is a warming closet. As shown in the illustration, there is also a large lower shelf, which is a useful adjunct.

The stove is substantially built of blue steel with nickel-plated trimmings. It is provided with three-position snap switches, so that the heat for each burner may be either high heat, medium heat or low heat. The high-heat consumption for each burner is 880 watts, the medium heat 440 watts and the low heat 220 watts. Two heating units are provided for the oven, one located at the top and the other at the bottom, each consuming the same amount of electricity and controlled in the same way as the "griddle" burners. The oven is well insulated and will bake or keep food hot long after the supply of energy is turned off.

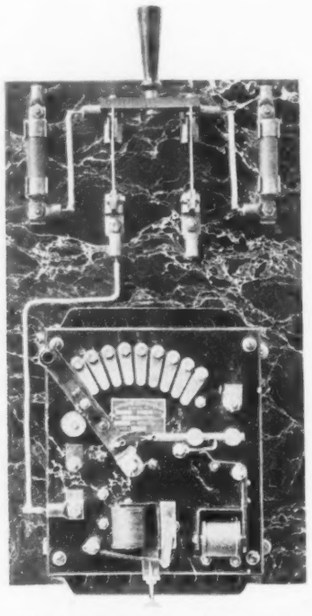
By the use of two heating units and the three-position switches nine different heat combinations can be effected for the oven. Baking ovens require a temperature of from 250 deg. F. to 450 deg. F., depending upon the nature of the work to be done. With the electric stove the time required for baking is about the same as with gas or coal, but the heat is utilized more efficiently, and there is no appreciable increase in the temperature of the air in the room where the oven is in operation. Of course, the electric stove is perfectly clean and odorless and in the highest degree convenient. The use of a stove of this kind means naturally a desirable addition to the day load of the central station.

Electric Stove.

UNIVERSAL DIRECT-CURRENT SPEED REGULATOR.

The illustration shows a universal speed regulator for motors with underload and overload release, designed for direct-current service and made by the Independent Electric Manufacturing Company, of Milwaukee. This device is available for regulating the speed of direct-current motors operating printing presses, ventilating fans and all kinds of machinery. It is made in several sizes and voltages and is fireproof. The frame is constructed of angle iron, and in the type illustrated the box is made of gray-iron castings and the face panel of marbleized slate. The switch and fuses are mounted on the panel, the device being complete for motor installation without wiring.

One interesting feature of this speed regulator is a device invented by Mr. W. H. Gaulke, general manager of the company. This feature consists of a horizontal ratchet bar which holds the contact lever squarely on each contact. The ratchet bar is connected to the lever by means of a link. Notches on the bar correspond with the various positions of the lever, insuring perfect alignment over each contact segment and preventing halfway positions of the lever in operation. A pawl engages the notched bar, holding the lever firmly in place at each position. When worn the horizontal ratchet bar may be replaced quickly and easily at nominal cost and it is not necessary to replace the entire lever.



Direct-Current Speed Regulator.

Industrial and Commercial News

The Week in Trade.

HESITATION is again noticeable in the attitude toward new business commitments, and buying continues in small amounts for early delivery. Weather conditions have helped some branches of trade and advancement of the season has expanded coal and retail lines. A large volume of inquiries for steel has followed the reduction of prices and orders for cars, rails and bridge equipment in fair amounts are expected shortly. Prices in the pig-iron market are wavering and show signs of becoming lower, and orders are not coming in as rapidly as is desired. Actual output in the iron and steel trades is fairly large as compared with last year, but the income from this tonnage is not in the same proportion, on account of the low prices at which contracts were placed. The last fortnightly report on idle cars showed a total of 50,038 as compared with 64,283 in the previous statement. Another favorable statement was the Government condition report, issued this week, which indicated improvement in many of the crops. Traffic returns are irregular and but few of the roads are showing substantial increase in receipts. The Supreme Court convened on Monday and is to be in session until June. Conditions in the Southwest are reported as fairly satisfactory and steady progress is being made in that part of the country. There are many encouraging features in the trade situation, such as the large trade balance of the country, the prevalence of cheap money and the excellent harvest outlook, but, while these factors are recognized, immediate growth to former activity cannot be expected. Improvement in sentiment, if not in actual volume of business, is being made each week and will be reflected in future transactions Business failures for the week ended Oct. 5 as reported by *Bradstreet's*, were 201, as compared with 248 in the previous week, 192 in the corresponding week in 1910, 203 in 1909, 256 in 1908 and 192 in 1907.

The Copper Market.

DECREASE in deliveries and production and increase in surplus stocks as compared with August were shown in the September report of the Copper Producers' Association which was issued on Monday of this week. Copper stocks in the United States increased 7,453,355 lb. during the month and production dropped to 115,588,950 lb. as compared with 125,403,667 lb. in August. Total consumption was only 108,135,595 lb., a falling off of over 21,000,000 lb. as compared with deliveries of 129,791,034 lb. in the month preceding. Domestic deliveries were 57,311,584 lb. as compared with 59,936,364 lb. in August and export deliveries dropped from 69,855,660 lb. to 50,824,011 lb., which is the smallest total thus far in the current year with the exception of 45,000,000 lb. in February. Stocks on hand Oct. 1 were 140,804,856 lb. as against 133,441,501 lb. on Sept. 1. No particular significance is attached to the smaller production, since 4,000,000 lb. of the 10,000,000-lb. decrease is attributed to one less working day in September than in August, 3,000,000 lb. to operating difficulties and the remaining 3,000,000 lb. to smaller shipments on the Lakes. Domestic deliveries, while showing a small decrease, were at the daily rate of 1,910,386 lb., which shows a trifling decline when compared with the rate of 1,933,398 lb. per day in August. The 19,000,000-lb. drop in export deliveries is the controlling factor in the report and industrial disturbances abroad were the chief cause of this decrease. The week in the copper trade has been dull and prices have continued to show a downward tendency. A slightly better tone has appeared in the export market, and exports for the month, including Oct. 10, aggregate 5075 tons. The daily call on the Metal Exchange, Oct. 10, quoted copper as per the accompanying table.

Standard Copper.	Bid.	Asked.	Settling Price.
Spot	11.75	11.85	.....
October	11.75	11.85	11.80
November	11.75	11.85	11.80
December	11.75	11.85	11.80
January	11.75	11.85	11.80

The London market, October 10, was as follows:

	Noon. £ s d	Closing £ s d
Standard copper, spot	54 10 0	55 6 3
Standard copper, futures	54 6 3	55 2 6

Extreme fluctuations for this year.

	Highest.	Lowest.
Standard	12.35c	11.57½c
London, spot	£57 10 0	£53 7 6
London, futures	58 2 6	54 0 0
Best selected	61 10 0	57 5 0

Industrial and Commercial Notes.

General Electric Orders.—Among orders recently received by the General Electric Company, Schenectady, N. Y., are the following: From the Metropolitan West Side Electric Railway Company, of Chicago, Ill., for two 2000-kw, 600-volt rotaries, six 700-kw, 9000-450-volt transformers, two 20,000-cu. ft. blower sets and a switchboard; from the Fairmont & Clarksburg Traction Company, of Fairmont, W. Va., for three 300-kw, 1200-600 volt rotary converters, nine 110-kva transformers and a switchboard for Clarksburg, W. Va.; from the City & County Contract Company, of New York City, for one gasoline-electric equipment for construction car and control equipment, for the New York, Westchester & Boston Railway Company; from the Des Moines City Railway Company, of Des Moines, Ia., for a switchboard; from the Lewiston, Augusta & Waterville Street Railway Company, of Lewiston, Maine, for one 300-kw, two-unit motor-generator set and a switchboard; from the Waldameer Construction Company, of Erie, Pa., for one GE-205, four-motor car equipment with controller for the Erie & Suburban Railway Company; from the Pacific Electric Railway Company, of Los Angeles, Cal., for one motor-generator set, one 17-kw, 500-125-volt exciter and three core-type transformers; and from the Delaware & Hudson Company, of Albany, N. Y., for one gas-electric motor car.

New Boston Edison Buildings.—The Edison Electric Illuminating Company of Boston has purchased the athletic field formerly used by Boston College, comprising 367,134 sq. ft., fronting on Massachusetts Avenue, near Everett Square, Dorchester. The property is assessed for $111,100. In addition the Edison company has bought 88,700 sq. ft. of land adjoining, making a total tract of ten acres, on which it is proposed to erect several buildings to cost about $500,000. The growing needs of the construction and operating departments demand larger facilities and it is planned to erect a complete service depot, embracing a stable, garage, machine shop, storerooms, and general construction and operating offices for the departments having this work in charge. Part of the property will be laid out for tennis courts and a baseball diamond for the use of employees. The library now in the Boylston Street building will be removed to the new plant. At the annual meeting of the company, to be held next Tuesday, the stockholders will vote on the proposal to fund the new extension.

Garwood Electric Company.—The Garwood Electric Company, of Garwood, N. J., for which Charles N. Fowler, Jr., of Elizabeth, N. J., has been appointed receiver in chancery, is not only completing its unfilled orders, but is also taking new business, the assets of the company being, it is stated, largely in excess of its liabilities. All of the branch offices of the company are soliciting business, as usual, and reorganization plans are now being considered.

Brooklyn Edison Contract.—The Bush Terminal Company, which operates an extensive system of model loft buildings on the Brooklyn waterfront, has renewed its contract with the Edison Electric Illuminating Company of Brooklyn for a period of five years. Over 4000 hp is now being supplied from the mains of the central-station company to this customer.

Holtzer-Cabot Electric Company.—Fire caused over $200,000 damage to a four-story factory building and contents belonging to the Holtzer-Cabot Electric Company at Brookline, Mass., last week. Nearly all the loss was covered by insurance.

Allis-Chalmers Company.—Following new low prices in Allis-Chalmers preferred stock and 5 per cent bonds in the New York market early this week, Vice-president Nichols issued an official statement on the company's affairs in which he said: "For some time past the volume of new business with our company—the same as with other concerns of whom we have any knowledge—has been unsatisfactory. Our product is not one of necessity in the sense of being one that is daily consumed by the population. It consists of heavy machinery, power plants, etc., for which, as new enterprises are now being held in abeyance, a market must be found among industrial and other going concerns who themselves are now operating far below capacity, with consequently little incentive or courage to increase their capital expenditures. There seems to be no immediate prospect of revival. We are undertaking to operate the manufacturing plants of the company and to conduct its business affairs to meet the best interests of the security holders. Our company has current assets greatly in excess of its current liabilities. Our semi-annual audit is now in progress by our regular auditors, whose figures are not yet available. It has been decided by the board of directors to change the ending of our fiscal year from June 30 to Dec. 31, so that hereafter the closing of the books will correspond to the periods of statements now required to be made annually to state and federal authorities." The annual report of the company will be made public within a short time.

United Missouri River Power Company.—On application of the United States Mortgage & Trust Company, a receiver has been appointed for the United Missouri River Power Company, which was mentioned in these columns Sept. 30 in connection with non-payment of interest on $1,850,000 of its 6 per cent gold notes. The company was incorporated in February, 1906, in New Jersey, as a consolidation of the Missouri River Power Company and the Helena Transmission Company; this brought under one control two large water powers on the Missouri River, aggregating some 18,000 hp, and an auxiliary steam station of 6000 hp in Butte. The lines of the company extend to Butte, Helena and Anaconda. In January, 1910, the Capital City Power Company, which owned a third water-power on the Missouri River with a capacity of 25,000 hp., was acquired by the United Missouri River company. The authorized capital stock of the company is $12,500,000, of which $10,000,000 is outstanding, and $1,500,000 7 per cent cumulative preferred, of which $1,375,000 is outstanding. S. T. Hauser is president of the company and W. B. Gower is its secretary. It has a New York office at 20 Exchange Place.

Underpaid Postage on Foreign Letters.—A recent issue of the *Bulletin* of the Berlin, Germany, American Association of Commerce and Trade prints the following communication from a member of that body: After the introduction of the 2-cent rate of postage to Germany by German steamers, all Americans in Germany hoped underpaid mail matter would cease. Unfortunately they did not reckon with American mailing clerks, or rather mailing boys! Lately complaints have been universal on the part of American firms in Germany of underpaid letters. Americans are in most respects practical business men; why are they not in the matter of prepaying postage? Letters might just as well be sent wholly unpaid, as nothing is gained by part payment. Extra postage is getting to be a regular, although wholly unnecessary, item in the expense account of American firms in Germany. The sums paid out for extra postage by any one firm in a year would feed a moderate-sized family for that length of time!

Sedalia Light & Traction Company.—Announcement is made that a decree of foreclosure of the Sedalia Light & Traction Company has been entered and that sale under the decree is expected to take place in the near future. The property will probably be bid in by the bondholders' committee and in that case any bondholders who do not deposit their bonds with the committee will receive only their pro rata share of the amount bid by the committee, less expenses and receivers' obligations. Undeposited bonds will be received by the committee at the New York Trust Company until Oct. 16, after which time they will be received only at the discretion of the committee, on such terms as it may direct. Over $500,000 par value out of the total issue of $749,000 is now represented by the committee.

General Motors Truck Company.—The General Motors Truck Company has been formed to market the commercial automobiles made by the General Motors Company. The Rapid-Reliance Company, of Illinois, with an office at 2241 South Wabash Avenue, Chicago, is agent for the General Motors Truck Company, which has its headquarters in Detroit. A line of commercial cars comprehensive enough to cover every business requirement will be made eventually. The nucleus of this line will be formed by the "Rapid," which is built with capacities of from ½ ton to 3 tons and the "Reliance," with capacities of from 2½ tons to 5 tons.

American Electric Fuse Company.—On Nov. 1 the factory, plant and business of the American Electric Fuse Company, of Muskegon, Mich., bankrupt, will be offered for sale to the highest bidder at the plant in Muskegon by Paul S. Moon, trustee in bankruptcy. Sealed bids will be received for the complete plant or for one or more of the three divisions; that is, (1) telephone and electrical supplies, (2) wire and insulation equipments, and (3) rheostats and current controllers. The wire business is carried on in a separate building, and if this is sold separately the building and equipment will be included.

"Conta" Flaming-Arc Lamps.—The Regina Electricitäts Gesellschaft, G. M. B. H., of Cologne, Germany, manufacturer of the "Conta" flaming-arc lamp and the "Iota" tungsten lamp, wishes to dispose of its American patent. Its exhibit at the Turin Exposition, at which 130 "Conta" flaming-arc lamps were installed on a 6300-volt, three-phase circuit, was awarded to Grand Prix and a Diplome d'Honneur. A Grand Prix was also received at Marseilles in 1908 and at Brussels in 1910. The General Electric Company of London has acquired the British patents.

Goulds Manufacturing Company.—Business of the Goulds Manufacturing Company, of Seneca Falls, N. Y., manufacturer of pumps, is running at only a slightly lower rate than last year's, which was the largest in the history of the company. A representative says: "This year's business in hand pumps and small machinery is the biggest we have ever had, while our business in large power pumps and heavy machinery is slightly lower than it was last year. As has been the case for several years past, our export business is good and is showing a steady increase."

Westinghouse Foreign Business.—It is stated that during the past five months the foreign interests of the Westinghouse Electric & Manufacturing Company have done a much better business than in any corresponding period in the history of the company. Domestic business is showing a falling off, and it is expected that the annual report of the company will show between 9 per cent and 10 per cent on the common stock after meeting preferred requirements. After payment of 7 per cent preferred dividends last year, 12.3 per cent was shown on the common stock.

Wireless Commissions Were Large.—In the answer filed in the Supreme Court in the suit against George H. Parker, a former director and Western agent of the United Wireless Telegraph Company, for selling his own stock instead of treasury stock, it was stated that gross commissions in two years from the sale of some 85,000 shares amounted to $1,315,945. After payments to sub-agents and general expenses Parker's share was, he said, $200,000.

Toledo Railways Change Rumored.—Advices from Toledo contain rumors that Albion E. Lang, president of the Toledo Railways & Light Company, will resign prior to January 1, 1912. It is stated that Mr. Lang accepted the post with the intention of serving during franchise negotiations between the company and the city of Toledo, and that the rumored action is due to the prolonging of these matters.

Dominion Light, Heat & Power Company Sold.—The Canadian Light & Power Company has purchased the Dominion Light, Heat & Power Company's plant at Montreal and will make use of the company's franchise and power station to still further increase its business in that city.

Aluminum Notes and Prices.—The aluminum market, as of Oct. 10, is reported firm, with ingots for remelting quoted at 20@22 cents spot No. 1, the base for large ingots. Rods and wire are held at 21 cents and sheets at 33 cents.

Sale of Winnipeg Electric Railway Halted.—Advices from Winnipeg state that the special committee appointed to consider the purchase of the Winnipeg Electric Railway by the city has voted against the proposition.

Financial.

THE WEEK IN WALL STREET.

IRREGULARITY has characterized prices on the New York list since last report, and in comparison to the activity of the past few weeks the market has been exceedingly quiet. Weakness appeared last Friday after the President's remarks on anti-trust laws and the downward movement extended into trading on Monday. Pressure on Reading in the early transactions brought losses in this issue, in marked contrast to advances in Louisville & Nashville shares, and bonds of the Atlantic Coast Line later in the day. The Department of Agriculture issued its report on the grain crops on Monday, and

NEW YORK.

	Oct. 3.	Oct. 10.	Shares Sold.		Oct. 3.	Oct. 10.	Shares Sold.
All. Ch.....	6*	3	2,900	Int. Met., pf.	42	45	13,650
All. Ch., pf..	16½*	12½	900	Mackay Cos.	82¾*	85*	400
Amal. Cop...	49⅝	49⅜	70,330	Mackay, C.,pf.	72½*	72½	100
Am. D. T....	33⅛*	33⅛*	———	Man. Elev....	132*	132*	———
Am. Loco....	35½*	34¾	820	Met. St. Ry..	15*	15*	———
Am. Loco., pf.	105⅛	105*	300	N.Y.&N.J.Tel.	139½	139½*	———
Am. Tel. & C.	80½*	80½*	———	Steel, com...	60⅝	59	919,700
Am. T. & T..	133⅜	134⅝	8,624	Steel, pfd....	109¼	109	10,257
B. R. T.....	73¾	74¼	5,000	W. U. T....	77⅜	79¾	29,900
Gen. Elec...	148½	149½	1,400	West'h, com..	62¾*	61¼	300
Int. Met....	15	14⅞	11,600	West'h, pfd..	110½*	115	100

PHILADELPHIA.

	Oct. 3.	Oct. 10		Oct. 3.	Oct. 10
Am. Rys.....	44	44	Phila. R. T.....	21⅞	21¾
El. Co. of A.....	11⅝	11¾	Phila. Elec.....	16¾	16⅜*
Elec. St. Bt'y.....	51	51¼	Phila. Trac.....	82¾	83
Elec. St. Bt'y., pf...	30*	30*	Union Trac.....	49¾	49½

CHICAGO.

	Oct. 3.	Oct. 10		Oct. 3.	Oct. 10
Chi. City Ry.....	186*	186*	Com. Edison.....	134	135¼
Chi. Elev. Rys.....	24*	24*	Chi. Subway.....	2¼	1¾
Chi. Elev. Rys., pf..	89½*	89½*	Chi. Telephone.....	120	120
Chi. Rs., Ser. 1....	92*	92*	Nat'l Car.....	101*	101*
Chi. Rs., Ser. 2....	27*	27*	Nat'l Car, pf.....	118½*	118½*

BOSTON.

	Oct. 3.	Oct. 10		Oct. 3.	Oct. 10
Am. T. & T.....	133⅝	134⅝	Mex. Tel.....	3*	3*
Cum. Tel.....	149⅞*	149⅞	Mex. Tel., pf.....	6*	6*
Edison	280*	285	N. E. Tel.....	143¼*	146
Gen. Elec....	148½	149½	1,400 W. T. & T.....	18*	19
Mass. E. Ry.....	19	19⅜	W. T. & T., pf.....	95*	95⅛
Mass. E. Ry., pf....	89¾	92			

*Last price quoted.
Shares sold for the week Oct. 2 to Oct. 7.

while its estimated yields are under records of former years it gave promise of harvests well up to the average. A large degree of interest was shown in the weekly statement of the Imperial Bank of Germany, which indicated recovery from the large demand incurred by September requirements and approach of normal conditions. Tuesday's market was strikingly inert, and the range of price changes was the narrowest for a considerable length of time. Many of the usually active stocks did not figure in the trading until near the close, and total sales were only 254,043 shares. Selling of cotton options at new low prices and the statement of unfilled orders on the books of the Steel Corporation were incidents of the day. The steel report showed a slight decrease, bookings on Sept. 30 being 3,611,000 tons as compared with the 3,696,000 tons of the August statement, but, in spite of this, the showing was better than had been expected. Excepting for small advances in Paris foreign discount rates have shown little change. Loans are being made from New York to German banks in heavier volume and shipments to Southern centers for crop financing is becoming more pronounced. The record of withdrawals this week has been much larger than usual. Rates in the money market Oct. 10 were: Call, 2¼@2⅜ per cent; ninety days, 3½@3¾ per cent. The quotations in the tables are those at the close Oct. 10.

FINANCIAL NOTES.

Annual Report of Boston Edison Company.—As forecasted in these columns Aug. 19, the report of the Edison Electric Illuminating Company of Boston for the year ending June 30, 1911, shows very satisfactory growth in all branches of the company. Gross earnings, as previously reported, were $5,257,914 and expenses, not including depreciation, were $2,243,276, leaving net earnings of $3,014,637, which compares with $2,602,228 for the preceding year. Miscellaneous income was $78,271, making a total net income of $3,092,909. Taxes were $608,595, as compared with $546,508 in the previous year, and after deduction of this item, and $179,316 for interest, there was left a balance of $2,304,997 available for dividends, which is equivalent to 14.73 per cent on the $15,603,700 capital stock outstanding and compares with $1,909,145 in the previous year. Dividends were $1,867,035, leaving a surplus of $437,962 as against $413,548 in the year ended June 30, 1910. The total connected load on June 30, 1911, in 50-watt equivalents was 2,773,838, which compares with 2,408,926 on the corresponding date in the previous year. President Charles L. Edgar, in his report to the stockholders, says in part: "As no new properties were absorbed during the past year, the report shows the increase which your company obtained through its regular growth. This is by far the largest in its history and, with the exception of last year, is more than double that of any previous year. There have been very few changes in the property of your company during the year just past. The growth of the business in the newer Back Bay district has necessitated enlarging the Scotia Street substation, and the adjoining lot of land, referred to in the report for 1908, has been used, and there has been erected thereon a three-story addition, covering approximately 2700 sq. ft. of land. The new steam turbo-generator referred to in last year's report has been installed and is just about being put into operation. It is, at the moment, the largest steam turbine in the world. During the year the stock authorized by the board of Gas & Electric Light Commissioners for the purchase of the electric property of the Lexington company has been issued, 424 shares having been sold at auction for $119,952. The 177 shares left over from the previous issue have also been sold, so that there is not, at the present time, any stock in the treasury authorized and unissued. Although the growth of your company during the past year has been satisfactory, there does not seem to be any immediate need for new capital, and it is probable that no steps toward an additional issue of stock will be taken for some months."

Oakland Railways.—Banking houses are offering $2,500,000 collateral trust, 6 per cent, four-year gold notes of the Oakland Railways, which is a merger of the Oakland Traction Key Route and other companies operating 230 miles of electric railways along the entire east shore of San Francisco Bay. The cities and towns of Oakland, Alameda, Berkeley, San Leando, Richmond and others lie within this area. The notes are dated Sept. 1, 1911, and are due Sept. 1, 1951. The collateral to be deposited as security for the issue consists of $3,391,000 of underlying bonds of more than two-thirds of the capital stock of all the underlying companies; of $2,500,000 demand guaranty notes of underlying companies, and the direct guaranty of these companies is indorsed on the notes. Gross earnings in the twelve months ended June 30, 1911, were $4,414,416, operating expenses, including taxes, were $3,017,662, leaving net earnings of $1,396,754. Interest on bonds now outstanding was $858,349, leaving a surplus applicable to interest on notes of $538,405, or over three and one-half the $150,000 required.

Spokane & Inland Empire Electric Railroad Company.—Total revenues of the Spokane & Inland Railway Company from transportation in the year ended June 30, 1911, were $1,669,638, which is a decrease of $93,976 from last year's returns. Operating expenses were $1,194,578, which represents an increase of $112,410 as compared with those in the previous year. Net operating revenue was $745,060, representing a decrease of $206,388 for the year. Carl R. Gray, president of the company, says in the report that, while the street-railway system in Spokane shows an increase over the returns in the previous year, decreases on the interurban lines in northern Idaho and eastern Washington were shown.

Montreal Tramway Bonds.—New York and Chicago banking interests have purchased $10,000,000 first and refunding mortgage 5 per cent bonds of the Montreal Tramways Company. The proceeds of these bonds will furnish the company with funds for use in connection with the purchase of the property of the Montreal Street Railway Company and for retirement of certain bonds of this company. The sale of these bonds represents the largest block of bonds sold by Canadian corporations, with the exception of Canadian railroads. The purchasers will offer them for sale within a short time.

Western Union's Year.—The full pamphlet report of the Western Union Telegraph Company for the year ended June 30, 1911, shows that the company earned 5.38 per cent on its $99,817,100 capital stock, as compared with 5.49 per cent on the same amount in the previous year. Gross telegraph earnings were $34,714,810, as compared with $31,788,246, and miscellaneous earnings were $763,983, as against $965,865. Total earnings were $35,478,793, as compared with $32,754,111 in 1910. Expenses and taxes, including rental of leased lines, reconstruction, repairs, etc., were $30,053,631, as against $26,614,303. Net earnings were $5,425,161, as compared with $6,139,808. Other income in 1911 was $1,680,196, and was $1,135,092 in 1910, making total net incomes of $7,105,357 and $7,274,900, respectively. Interest charges were $1,733,389, as compared with $1,687,830, leaving a surplus of $5,371,968 available for dividends, as compared with $5,587,070 in the previous year. Dividends in 1911 and 1910 were $2,991,304 and $2,989,696, respectively, leaving balances after all deductions of $2,380,663 in 1911 and $2,597,374 in 1910. In his report to the stockholders President Theodore N. Vail says, in part: "The large increase in gross is more than offset by the increase in the expenses of $3,167,853—13.14 per cent—causing a decrease of $148,889 in the net revenue. Of this increase in expenses $2,369,434 was for salaries and wages, an increase in this item of 21.18 per cent over last year. While your company has had a great past, and cannot fail to have as great a future, present conditions, resulting from a long period of unsettled business and labor conditions and of economies and retrenchment, are, from a conservative standpoint, far from satisfactory."

National Light & Power Company.—The National Light & Power Company has been incorporated under the laws of New Jersey with an initial capital stock of $500,000, and with Judson H. Boughton as president and W. C. Morehead as secretary and treasurer. The corporation will be a holding and engineering company for gas, electric, street railway and hydroelectric properties, with the home office in St. Louis in the same quarters as the National Light & Improvement Company, which syndicate is now in the process of dissolution. Judson H. Boughton, president, has been identified with the National Light & Improvement Company as secretary and treasurer, president of the Waco, Texas, Citizens' Railway Company, vice-president and general manager of the gas and electric properties at Waco and Ft. Worth, and also associated with the various other interests of the National Light & Improvement Company's properties. W. C. Morehead has been an official in the subsidiary corporations of the National Light & Improvement Company, with headquarters at Waco and Ft. Worth, but he will now remove to St. Louis and take up the duties of secretary and treasurer of the new parent organization.

American Telephone & Telegraph Company.—The report of the American Telephone & Telegraph Company for the twelve months ended June 30, 1911, as filed with the Massachusetts Highway Commission, shows gross income of $17,344,680 as compared with $16,503,890 in the corresponding period of the previous year. Operating expenses were $8,004,562, comparing with $8,446,731, and net income was $9,340,118 as compared with $8,057,159. Other income was $24,127,177, comparing with $24,017,390, making a total net income of $33,467,295, which is an increase over the $32,074,547 in the preceding period. Charges were $6,386,314 and left a surplus of $27,080,981, which compares with $26,285,440 and represents 9.83 per cent earned on $275,435,325 stock outstanding, as compared with 10.1 per cent on $259,846,200 stock in the corresponding period last year. Dividend requirements were $21,194,025, as compared with $19,747,337, and left a surplus of $5,886,956, which compares with $6,528,103 last year. The report of the company for the third quarter will appear in next week's issue.

Nashville Railway & Light Company.—The report of the Nashville Railway & Light Company for August shows gross earnings of $154,254 comparing with $146,038 in August, 1910. Expenses and taxes were $93,471 as compared with $87,748, and net earnings were $60,783 as compared with $58,290. Charges, depreciation and preferred dividends were $148,969, leaving a surplus for the month of $11,814, which compares with $10,115 in August of the previous year. In the eight months ended Aug. 31 gross earnings of the company were $1,261,044 as compared with $1,178,540 in the corresponding period last year. Expenses and taxes were $751,476 as compared with $688,471, leaving net earnings for the period of $509,567, as against $490,068 in the eight months ended August 31, 1910. Charges, depreciation and preferred dividends were $390,097, which left a surplus for the eight months of $119,470, which compares favorably with $102,574 in the corresponding eight months of 1910.

Bids Wanted on North Carolina Utility Bonds.—Sealed bids will be received by the clerk of the board of commissioners of the town of Wilson, N. C., until Jan. 1, 1912, for the purchase of $74,000 5 per cent coupon bonds, known as "Refunding electric-light and water-works bonds of the town of Wilson." These bonds will mature twenty years after date of issue and interest will be payable semi-annually at the office of the treasurer of the town of Wilson or at some bank in New York City at the option of the purchaser. Each proposal must be accompanied by a certified check for $1,000, payable to the order of the treasurer of the town of Wilson as guarantee of good faith and to be forfeited to the town in the event of failure of the successful bidder to comply with bid within ten days from opening of same. For further information address Theodore A. Hinnant, clerk board of commissioners.

September Business of Western Electric Company.—An increase of 12 per cent. as compared with September, 1910, was made in the volume of sales of the Western Electric Company last month. This gain was particularly noteworthy not only in view of the dullness in the preceding four months, but because it was also the largest gain in any one month this year, and made the largest September showing in the history of the company. In the eight months ending Aug. 31 the gross business of the Western Electric Company was about 4 per cent in excess of that in the corresponding period last year and gross business for the year, as previously stated in these columns, is expected to reach $66,000,000. From present indications the company expects to be able to occupy over 200,000 sq. ft. of new floor space at the Hawthorne plant by January 1. A new merchandise building is included among other additions at this plant.

DIVIDENDS.

Columbus Railway Company, quarterly, preferred, 1¼ per cent, payable Nov. 1.

Eastern Consolidated Electric Company, semi-annual, 2 per cent, payable Nov. 1.

Edison Electric Illuminating Company of Boston, quarterly, 2 per cent, payable Nov. 1.

Milwaukee Electric Railway & Light Company, quarterly, preferred, 1½ per cent, payable Oct. 31.

Westinghouse Electric & Manufacturing Company, quarterly, preferred, 1¾ per cent, payable Oct. 16.

West Penn Traction Company, quarterly, preferred, ½ per cent, payable Oct. 16.

REPORTS OF EARNINGS.

BLACKSTONE VALLEY GAS & ELECTRIC COMPANY.

Period.	Gross Earnings.	Operating Expenses.	Net Earnings.	Fixed Charges.	Net Surplus.
August, 1911.....	$89,545	$42,647	$46,898	$30,152	$16,746
August, 1910.....	81,376	40,236	41,140	30,222	10,918

COLUMBUS ELECTRIC COMPANY.

August, 1911.....	$39,573	$21,272	$18,301	$10,414	$7,887
August, 1910.....	39,328	16,540	22,788	17,887	4,901

DALLAS ELECTRIC CORPORATION.

August, 1911.....	$129,851	$83,884	$45,967	$25,518	$20,449
August, 1910.....	118,257	82,637	35,620	25,659	9,961

EL PASO ELECTRIC COMPANY.

August, 1911.....	$50,588	$30,428	$20,160	$8,343	$11,817
August, 1910.....	46,897	30,730	16,167	8,215	7,952

GALVESTON-HOUSTON ELECTRIC COMPANY.

August, 1911.....	$142.326	$76,197	$66,129	$25,200	$40,929
August, 1910.....	124,764	65,932	58,832	25,965	32,867

NASHVILLE RAILWAY & LIGHT COMPANY.

August, 1911.....	$154,254	$93,471	$60,783	$48,969	$11,814
August, 1910.....	146,038	87,748	58,290	48,175	10,115

NORTHERN TEXAS ELECTRIC COMPANY.

August, 1911.....	$135,529	$69,585	$65,944	$26,009	$39,935
August, 1910.....	119,813	63,953	55,860	20,300	35,560

PUGET SOUND ELECTRIC RAILWAY.

August, 1911.....	$155,665	$96,661	$59,004	$51,879	$7,125
August, 1910.....	173,988	100,168	73,820	52,145	21,675

SAVANNAH ELECTRIC COMPANY.

August, 1911.....	$58,680	$40,331	$18,349	$18,342	$7
August, 1910.....	56,870	37,680	18,190	18,182	8

SEATTLE ELECTRIC COMPANY.

August, 1911.....	$448,863	$230,443	$208,420	$116,260	$92,160
August, 1910.....	479,573	258,749	220,824	110,081	109,743

SIERRA PACIFIC ELECTRIC COMPANY.

August, 1911.....	$51,140	$17,375	$33,765	$4,345	$29,420
August, 1910.....	45,636	14,206	31,430	6,029	25,401

General News

Construction News.

PHOENIX, ARIZ.—Contracts have been awarded by the Salt River Valley Water Users' Association for the South Side Consolidated power station as follows: To Mario Brothers, of Philadelphia, Pa., for two traveling cranes; for 26 miles of copper wire and 17 miles of galvanized telephone wire to John Roebling's Sons Company, Trenton, N. J.; B. F. Kierulff Company, of Los Angeles, Cal., for 100 steel poles for power lines; to the Wesco Supply Company for 1200 ft. galvanized guy wire, 225 telephone insulators, 25 copper splicing sleeves and 30 clamps, and the Pierson Roebling Company for 350 insulators.

CEDARVILLE, CAL.—Plans are being considered by the Modoc County Irrigation Company for the erection of a hydroelectric power plant near Cowhead Lake.

FOREST, CAL.—Plans are being considered for utilizing electricity to operate the North Fork mine. Surveys are being made for transmission line and estimates of cost are being prepared.

LAKEPORT, CAL.—Surveys have nearly been completed by the Clear Lake Railroad Company for its proposed electric railway from Hopeland to Lakeport, a distance of 44 miles.

LONG BEACH, CAL.—The Pacific Telephone & Telegraph Company has been granted permission by the City Council for pole line and underground conduit work in certain sections of the city in which its franchise has lapsed, pending the decision on similar cases in neighboring cities.

LONG BEACH, CAL.—The Southern California Edison Company has submitted a bid offering to supply electricity for the city pumping stations at 1 cent per kw-hour between midnight and 6 a. m.; 1½ cents per kw-hour between 6 a. m. and 5 p. m.; 2 cents per kw-hour between 5 p. m. and 9 a. m., and 1½ cents between 9 p. m. and midnight.

LOS ANGELES, CAL.—The Los Angeles Railway Company contemplates the construction of an electric railway through Elysian Park.

LOS ANGELES, CAL.—Property owners on East Third Street, from Los Angeles Street to Santa Fe Avenue, have filed a petition with the City Council asking for the removal of the present overhead wires, and the establishment of a conduit district. All power companies in the city will be affected.

LOS ANGELES, CAL.—The Pacific Electric Railway Company is reported to be planning the construction of a four-track line between Los Angeles and Santa Monica, building two additional tracks along its present route. The company also proposes to make improvements to its system at Monrovia.

LOS ANGELES, CAL.—The finance committee of the City Council is reported to be considering plans for the distributing system for the proposed municipal electric power plant to be operated in connection with the Owens River aqueduct. It is proposed to issue $6,000,000 in bonds for the municipal electric power plant to be operated in connection with the Ownes pany, the Los Angeles Gas & Electric Company and the Southern California Edison Company, whose combined systems are valued at $8,500,000. In case the companies refuse to sell the city is planning to lay its own conduits parallel to those of the three companies. The city will have a surplus of 150,000 hp from the Owens River aqueduct plants.

MARTINEZ, CAL.—Maps and permits showing the route to be taken along the water front by the Great Western Power Company have been filed with the county clerk. Franchises along the water front from Crockett to Martinez, grant the company rights over many lines and the privilege of establishing a plant at Martinez.

PASADENA, CAL.—The City Council has appropriated $1,500 for the purchase of equipment for the municipal electric-light plant. C. W. Koiner is manager.

RANDSBURG, CAL.—The Southern Sierra Power Company has commenced work on the erection of a transmission line to the Randsburg mining district.

RICHMOND, CAL.—The Castro Point & Terminal Railway Company, recently organized, proposes to construct and operate an electric railway from Richmond to Winehaven.

SAN BERNARDINO, CAL.—The offer of the Pacific Electric Railway Company to build an electric railway in the northwest section of the city for a bonus of $18,000, has been accepted by the property owners of the district.

SAN DIEGO, CAL.—The electric division of the San Diego Southern Railway, between San Diego and National City, will be rebuilt.

SAN FRANCISCO, CAL.—The California Terminal Company, recently incorporated at San Francisco, Cal., proposes to construct an electric railway from San Rafael to Sacramento, a distance of 95 miles. C. W. Monlisk is interested in the company.

SAN FRANCISCO, CAL.—A special meeting of the stockholders of the Pacific Gas & Electric Company has been called for Oct. 23, to vote on the proposition of creating a new mortgage under which the company can issue bonds from time to time to an amount not exceeding $150,000,000 and to increase the common stock to an amount to enable it to comply with the California statute under which no corporation may have outstanding indebtedness in excess of its subscribed capital stock. The proceeds will be used for refunding or retiring existing issues of the companies and its subsidiaries, amounting to about $67,000,000. The remainder will be reserved for extensions and improvements, etc.

VALLEJO, CAL.—The Vallejo Electric Light & Power Company is reported to be preparing to extend its transmission lines to the O'Hara tract to furnish electricity for lamps and motors in that vicinity.

MONTROSE, COL.—The Federal Light & Traction Company has petitioned the City Council for a twenty-year extension of its franchise to permit the extension of its lighting service to the towns of Ouray, Ridgeway, Olath, Delta, Hotchkiss, Paonia and Cedar Edge.

PUTNAM, CONN.—The State Legislature has granted an amendment to the charter of the Putnam Light & Power Company, giving the company permission to furnish electricity in the town of Woodstock, and also allowing it take over the rights of the Pomfret Club.

WASHINGTON, D. C.—Sealed proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Oct. 17 to furnish at the navy yard, Brooklyn, N. Y., supplies as follows: Schedule 3943—Electric conduit and fittings. Schedule 3944—Electrical supplies. Schedule 3954—Hoist controllers. Applications for proposals should designate the schedule desired by number.

WASHINGTON, D. C.—An agreement has been reached between the Potomac Electric Power Company and the Commissioners of the District of Columbia, whereby the District of Columbia will save approximately $10,000 on its lighting contract. The company has been furnishing 700-cp lamps in many cases instead of 1000-cp lamps as contracted for and has agreed to reduce the rate from $85 to $80 each per year from October, 1909, to March, 1911. Announcement has been made that 750 new incandescent lamps are being erected around the White House and along Massachusetts Avenue as far as Union Station. It is also stated that orders have been given for 240 lamps for Potomac Park.

JACKSONVILLE, FLA.—The Postal Telegraph Company, it is said, will comply with the city ordinance requiring wires on Bay Street to be placed underground, at once, instead of waiting the maximum period of five years fixed by the ordinance. The cost of the work is estimated at from $25,000 to $30,000.

BAXLEY, GA.—At an election to be held Oct. 19 the proposition to issue bonds to erect an electric-light plant will be submitted to a vote of the people.

JACKSON, GA.—The City Council has entered into a contract with the Central Georgia Power Company to supply the city of Jackson with energy to the amount of 600 hp. A transmission line will be erected from the power plant to Jackson, work on which will begin at once.

ASSUMPTION, ILL.—It is reported that S. A. Shafer, superintendent of the local coal mine, has been granted a franchise to operate an electric-light system in Assumption. Electricity will be supplied from a generator at the mine. The erection of a distributing system is all that will be required. The Consolidated Electric & Manufacturing Company operates an electric plant in the city.

BEARDSTOWN, ILL.—The Beardstown Electric Light & Power Company is reported to have rejected the proposition of the City Council to enter into a contract for lighting the streets of the city under the terms of which the company was to supply arc lamps with all-night service at $4.50 each per month; $3.25 per lamp for midnight service and $1 each per month for 60-cp tungsten lamps. The Council is contemplating the installation of a municipal electric plant.

CHICAGO, ILL.—Sealed proposals will be received by the city of Chicago, Room 406, City Hall, Chicago, Ill., until Oct. 19, for furnishing and installing at the water-works shops, 2304 South Ashland Avenue, one 72-in. vertical motor-driven boring and turning mill, according to specifications on file at the office of the Department of Public Works, Room 406, City Hall. L. E. McGann is commissioner of public works.

DEPUE, ILL.—The Spring Valley Lighting Company, of Spring Valley, Ill., is negotiating with the Village Board for a franchise to supply electricity in Depue and a contract for street lighting. It is proposed to erect a transmission line from the Spring Valley plant to this village. The company now supplies electrical service in Cherry, Dalzell and Marquette. The company is reported to be contemplating extending its system to Grandville and Mark.

DIXON, ILL.—The City Council has agreed to pay for electricity for ornamental street lamps in the business district, provided the merchants will pay for the installation. It is proposed to erect forty-eight or more lamp standards.

DIXON, ILL.—The franchise of the Central Union Telephone Company has expired and the company has been notified that it must re-

move its poles and wires from the business district. It is expected that the wires will be placed underground.

EL PASO, ILL.—The City Council has granted E. H. Gray a twenty-year franchise to operate an electric-light plant in El Paso. The franchise provides for a twenty-four service and all-night street lighting service and a maximum rate of 12 cents per kw-hour for electricity for lamps with a discount of 10 per cent for prompt payment. The present street lighting contract of the El Paso Light & Power Company, of which Mr. Gray is manager, has been extended to June 1, 1913. The same number of lamps will be used, except that tungsten lamps will be substituted for the carbon lamps now in use. Tungsten lamps will be supplied at the rate of $17 each per year and arc lamps at $75 each per annum. The company will pump the city as at present, but has an option of installing an electric motor at its own expense and supplying electricity to operate the pumps at 4 cents per kw-hour.

FARMINGTON, ILL.—The City Council is contemplating the installation of an ornamental lighting system on McKinney Street. It is proposed to replace the present arc lamps with tungsten lamps.

LA SALLE, ILL.—Preparations are being made by the Chicago, Ottawa & Peoria Railway Company to increase the output of its power plant and place a portable substation on the eastern division.

LOCKPORT, ILL.—Owing to trouble at the local water-pumping station the City Council has decided to engage an electrical expert to make an investigation of conditions there and submit a report of same.

MACOMB, ILL.—The City Council has granted the Western Telephone Company a new franchise to operate in the city. The company will place its wires underground and make extensive improvements to its system.

MASCOUTAH, ILL.—The city of Mascoutah has purchased the electric plant of the Mascoutah Lighting Company for $9,000, to be owned and operated by the municipality. The citizens recently voted to issue bonds to the amount of $12,000 to take over the plant.

NEWMAN, ILL.—The electric plant of the Newman Electric Light Company was destroyed by fire on Oct. 3, causing a loss of about $18,000. A new generator just received but not installed was also destroyed.

PANA, ILL.—The Commercial Club has reported to the Council that the merchants have agreed to install fifty ornamental lamps, the cost not to exceed $50 each. An ordinance will be asked from the Council requiring all poles and wires to be removed from the business streets and all wires placed underground. The city, it is understood, will supply electricity and maintain the lamps after they are erected. Ornamental lamp standards, each carrying five lamps, will be installed.

PEORIA, ILL.—The Peoria Railway Company has applied to the Village Board of Averyville, a suburb of the city, for a twenty-year franchise. The company has at present a franchise, which has six years to run, but if granted a new franchise the old will be repealed. The Peoria Northern Railway Company has also asked for a fifty-year franchise to operate an interurban road through the village. If both are granted, the McKinley interests, which control both lines, contemplate extensive improvements, involving an expenditure of $60,000. The interurban project is said to be the first step toward the building of an electric railway between Peoria and Chillicothe and ultimately to Bureau Junction, connecting with the Chicago, Ottawa & Peoria Railway, giving the McKinley interests a through line from Ottawa to St. Louis, Mo.

SAYBROOK, ILL.—The Gibson City Electric Light & Power Company, of Gibson City, Ill., is planning to extend its transmission line to Saybrook, where the company has secured a franchise. The company agrees to sell electricity for business purposes at 10 cents per kw-hour and for domestic use at 12 cents per kw-hour. Especial attention will be paid to the development of the heat, light and power business.

EVANSVILLE, IND.—Arrangements have been made by the Evansville & Chrisney Railway Company for the construction of its proposed railway to connect Lynnville and Chrisney with Evansville. Substantial subsidies have been voted to aid in construction of the road. Contracts for construction of the railway will probably be awarded in the near future.

HOBART, IND.—Preparations are being made by the Gary, Hobart & Eastern Traction Company for the construction of its proposed railway between Gary and Hobart.

INDIANAPOLIS, IND.—It is expected that a contract will soon be awarded by the Indianapolis, Chicago & Meridian Railway Company for the construction of its proposed railway to connect Indianapolis, Sheridan, Gary, Hammond and Warsaw. M. J. Mooreland is secretary.

VINCENNES, IND.—The Board of Trade, it is reported, is planning to form a company to build a street railway to South Vincennes, a factory suburb. The Vincennes Traction Company, it is said, has refused to extend its lines to the addition.

ELLIOTT, IA.—Funds to the amount of $4,000 have been raised for the purpose of erecting a transmission line to supply electricity in Elliott and the farmers between Elliott and Griswold.

FARLEY, IA.—The construction of an electric railway to connect Farley, Garnaville and Luxemburg is under consideration. S. G. Durant, of Omaha, Neb., and associates are interested in the project.

MONTICELLO, IA.—The dam of the Monticello Electric Company was carried away recently by the flood in the Maqauketa River.

TOPEKA, KAN.—The Brown Telephone Company, of Abilene, the Concordia Telephone Company, of Concordia, the Solomon Valley Telephone Company, of Beloit, and the Smith & Flint Telephone Company, of Minneapolis, have been consolidated under the name of the United Telephone Company. The new company is capitalized at $500,000 and will take over all the Bell Telephone Company toll lines in that part of Kansas.

BOWLING GREEN, KY.—The Isbell-Chapman Electric Company has filed amendments to its charter changing its name to the William H. Isbell Electrical Company.

LONDON, KY.—Bids will be received at the office of the Supervising Architect, Washington, D. C., until Oct. 25 for a gas engine, electric generator, etc., for post office at London, Ky., in accordance with plans and specifications, copies of which may be obtained at the above office. James Knox Taylor is supervising architect.

LOUISVILLE, KY.—The Kentucky Electric Company has awarded a contract to the Robins Belt Conveying Company, of Cleveland, Ohio, for conveying machinery and to the Orten-Steinbrenner Company, of Chicago, Ill., for crusher and crane for its coal-handling and crushing plant.

LOUISVILLE, KY.—With a view of utilizing the water power of the falls of the Ohio River Mayor Head has authorized Assistant City Engineer Parsons to begin work of making a survey of the proposed power canal immediately. The route suggested for the canal begins at a point near the old waterworks pumping station, extending in a half circle to Beargrass Creek, through the creek bed to the south side of the race track, thence west to the river.

LOUISVILLE, KY.—Mayor W. O. Head is reported to be considering a bond issue for the purpose of purchasing the privately owned shares of the Louisville Gas Company, which controls the Louisville Lighting Company. These amount to 26,750 shares, the remainder being held by the city. H. M. Byllesby & Company, of Chicago, Ill., considered purchasing the controlling interest in the company, but the deal was blocked, owing to the refusal of the city to sell its holdings.

NEWPORT, KY.—The City Council recently entered into a contract with the Union Light, Heat & Power Company for the installation of 300 additional electric arc lamps in the city. At present there are only 150 lamps.

ORANGEBURG, KY.—Plans are being considered for the installation of an electric-light plant in this town. Orangeburg has not a post office and is located near Maysville.

PRESTONBURG, KY.—The Prestonburg Electric Light Company, it is reported, has increased its capital stock from $6,000 to $10,000.

NEW ORLEANS, LA.—The New Orleans Railway & Light Company has installed three new turbines, each rated at 1000 kw, at its central station at Market and South Peters Streets.

FREDERICK, MD.—The installation of an ornamental lighting system on Market Street is under consideration. The property owners propose to erect and maintain the system.

HAGERSTOWN, MD.—The Hagerstown & Clearspring Railway Company, which proposes to build an electric railway from Hagerstown through Cearfoss and Greencastle to Mercersburg, has awarded contract for 1200 tons of steel rails. The company has secured a right-of-way along a portion of the Hagerstown-Cearfoos Turnpike. Rights-of-way between Greencastle and Mercersburg have already been secured. It is announced that $100,000 has been subscribed toward the construction of the road. L. N. Downs is president of the company.

BEVERLY, MASS.—Bids are being received by Charles T. Main, of Boston, Mass., mill engineer and architect, for construction of new buildings for the Beverly Gas & Electric Company, as follows: One-story garage, 86 ft. x 52 ft.; two-story generator house, 60 ft. x 43 ft.; two-story purifier house and one-story meter house. Mill construction will be used.

BOSTON, MASS.—The Edison Electric Illuminating Company of Boston has purchased a large site on Massachusetts Avenue, near Edward Everett Square, Dorchester, on which it proposes to erect several buildings at a cost of about $500,000, to provide for the growing needs of its construction and operating departments.

COHASSET, MASS.—The Selectmen of Cohasset have engaged Professor Clifford, instructor in electrical engineering in Harvard College, to make investigations and report on the electric-light wiring system in the town. Electrical service is supplied by the Electric Light & Power Company, of Abington and Rockland, which purchases energy from the Edison Electric Illuminating Company, of Brockton, Mass.

DEERFIELD, MASS.—The Meadown Mills property, located a short distance below the Stillwater Bridge, has been acquired by Alexander J. Patterson, of Conway. It is proposed to construct a dam and erect a hydroelectric plant at this site.

GREENFIELD, MASS.—It is announced that the Greenfield Electric Light & Power Company intends to begin operations on the site of the dam near Stillwater Bridge, on the Deerfield River.

PLAINVILLE, MASS.—A special town meeting will soon be held to submit the proposition to authorize the Selectmen to enter into a contract with the Foxboro Electric Light Company to light the streets of the town for a period of three years.

SOUTH HADLEY FALLS, MASS.—The South Hadley Falls Electric Light Company has applied to the Massachusetts Gas & Electric

Light Commissioners for permission to extend its transmission lines to the town of Granby to supply electricity for lamps.

WORCESTER, MASS.—The Worcester Electric Light Company has announced that it will erect several electroliers of the type similar to that which the Worcester Merchants' Association has worked to have adopted for lighting the principal streets of the city. The company is erecting the lamps as an experiment.

GRAND RAPIDS, MICH.—The Grand Rapids Company will soon obtain electricity for operating its system from the Grand Rapids-Muskegon Power Company. The present equipment in the power house at Fulton Street and Ellsworth Avenue will be discarded and a rotary converter installed.

MARQUETTE, MICH.—The Gogebic & Iron County Railway & Light Company is planning to erect a hydroelectric plant on the Montreal River at Saxon. The proposed plant will supply electricity to its properties in Marquette and vicinity. The company will begin work at once on an extension from Bessemer to Marquette.

REPUBLIC, MICH.—The Cleveland Cliffs Iron Company is building a hydroelectric plant on the Carp River, near Marquette. The proposed plant will develop about 8000 hp. The power station will be located at the foot of the hill known as Mount Mesnard. The water will be conveyed to the power house through a pipe line 22,000 ft. long and 26 in. in diameter. The power station will be 88 ft. x 48 ft., and will be equipped with two generating units of 4000 hp each. The transmission line will be 10 miles in length and will be connected with an auxiliary steam station and distributing plant already in service at the Maas Mine, at Negaunee. The latter plant is also connected with a power plant at the Princeton mine in the Swanzy district and with the Cleveland Cliff iron properties in the Ishpeming and North Lake fields. The transmission system will cover a territory of about 40 miles. There will be a double circuit over the entire line. The wires will be carried on steel towers. The plant will involve an expenditure of more than $1,000,000.

FERGUS FALLS, MINN.—It is reported that S. O. Bridson, of Richland County, N. D., is negotiating with the Otter Tail Power Company, of Fergus Falls, for energy to operate a street railway which he proposes to build from the insane hospital to this city, through the business district to the Northern Pacific Railroad station. If a franchise is granted, it is said, work will begin on constructon of the road early in the spring.

MINNEAPOLIS, MINN.—The Council committee recommends an appropriation by the board of tax levy for 100 ornamental lamps to be erected on Washington, Nicollett and Hennepin Avenues. The cost of the lamps is estimated at about $10,000.

ST. PAUL, MINN.—The St. Paul Promotion Company, which has been organizing the Southern Electric Railway, or Lake Pepin Line, has consolidated with the Interurban Construction Company of Hastings. The Southern Electric Railway was to have extended from St. Paul through Hastings and Red Wing to Lake City. The Interurban Construction Company, of Hastings, meanwhile has commenced work on a railway from St. Paul through Hastings to Rochester, Minn. Both routes will be used by the new company, which is to be known as the Interurban Construction Company.

FREDERICKTOWN, MO.—C. L. Gates, of Waverly, Ill., is reported to have purchased the controlling interest in the Fredericktown Electric Light & Manufacturing Company. Earl Gates, formerly manager of the electric plant at Palmyra, Ill., will have charge of the local plant.

MEXICO, MO.—The North Missouri Central Railway Company, it is reported, has been reorganized and arrangements made whereby the road between Jefferson City and Columbia will be built by P. M. Johnson, of St. Elmo. This is part of the project to build an electric railway from Jefferson City to Mexico, via Columbia, 63 miles in length, and a branch line from Columbia to Moberly, a distance of 39 miles.

ST. JOSEPH, MO.—The promoters of the Kansas City, Clay County & St. Joseph Railway Company have been granted a franchise by the Buchanan County court to build and operate an electric railway over the county roads.

HELENA, MONT.—It is reported that a receiver has been appointed for the United Missouri River Power Company at the request of the United States Mortgage & Trust Company, of New York, N. Y., which holds bonds to the amount of $12,000,000 of the company. The power company owns power plants at Canyon Ferry, Hauser Lake and uncompleted hydroelectric plants on the Missouri River.

MISSOULA, MONT.—The Flathead Telephone Company, recently incorporated, proposes to construct and operate telephone, telegraph, electric-light and railway systems and also water-power plants in Missoula and Flathead Counties. A. H. Stevens, of Hamilton; V. H. Calhoun and F. C. Wilhelm, of Missoula, are interested in the company.

TERRY, MONT.—Application has been made to the Town Council by E. H. Phillips for a franchise to install an electric-light system in Terry. A special election will be held to submit the proposition to the voters.

KEENE, N. H.—The Keene Gas & Electric Company has applied to the Public Service Commission for permission to erect a high-tension transmission line from the power house of the Connecticut River Power Company in Hinsdale to its power house in Keene.

ELIZABETH, N. J.—Plans have been completed by the Broad Street Improvement Association for the installation of new arc lamps on Broad Street. The plans call for the erection of seventy-two lamps at a cost of $80 each per year, of which the association will pay $60 of the cost, the remaining $20 will be paid by the city. The total cost of the system will amount to $5,760 per annum.

ROSWELL, N. M.—The Berrendo Irrigation Company, which is developing a tract of about 14,000 acres near Roswell, has entered into a contract with the Roswell Light & Gas Company to supply electricity for operating the irrigating pumping plants. The company has erected 45 miles of transmission lines through the property and will extend the lines until the entire tract is covered. The contract limits the charge for electrical service to $1.25 per acre ft. and provides for a reduction for the service in proportion to the number of irrigators on the land and the amount used. The pumping plants are situated on shallow wells, the lift being from five to thirty-five feet. All of the pumps are of the 6-in. centrifugal type, each operated by a 25-hp motor, direct connected. The Roswell Light & Gas Company is planning to increase the output of its plant to 1500 hp. Two new 750-hp producer gas engines will be installed. The new plant will be built to provide for the installation of a second unit as needed.

AMSTERDAM, N. Y.—As a result of a hearing held recently by the Public Service Commission, Second District, on the application of the Edison Electric Light & Power Company, of Amsterdam, N. Y., for authority to exercise franchises for the erection of transmission lines, etc., for the distribution of electricity for lamps and motors in the village of Akin and the towns of Amsterdam, Mohawk and Florida, Montgomery County, Commissioner Sague, who conducted the hearing, announced that he would recommend granting the petition of the company. At present the localities which the company proposes to enter are without electrical service.

CORTLAND, N. Y.—Bids will be received until Oct. 24 by Dr. Andrew S. Draper, commissioner of education, State Normal College, Albany, N. Y., for electric wiring and fixtures at the State Normal School, Cortland, N. Y. Franklin B. Ware, of Albany, N. Y., is State Architect.

DUNDEE, N. Y.—Edward L. Bailey, owner of the local electric-light plant, has submitted a proposition to the Board of Village Trustees offering to sell the property to the village. The proposition submitted calls for payment by the town of $150 per month to Evelyn H. Bailey for the balance of her natural life, or should she not survive twenty years from the time the agreement is made, the village is to pay her heirs or executors the above-stated sum until the twenty years have passed. According to the offer made the village would be required to pay at least $36,000 for the plant. It is stated that the trustees do not approve of the purchase of the plant.

LESTERSHIRE, N. Y.—Plans are being considered for the installation of an ornamental lighting system on Main Street. Estimates for cost of same have been submitted by the Binghamton Light, Heat & Power Company, which furnishes the street-lighting service in Lestershire. It is proposed to use cluster lamps erected on ornamental standards.

LONG ISLAND CITY, N. Y.—The New York & North Shore Railroad Company has applied to the Public Service Commission for permission to issue bonds to the amount of $1,500,000 and capital stock to the amount of $771,764, the proceeds to be used for improvements to its system.

NELLISTON, N. Y.—The Ft. Plain Gas & Electric Light, Heat & Power Company has been granted authority by the Public Service Commission, Second District, to lease its plant in the village of Nelliston to the Mohawk Hydroelectric Company, of Ephratah, N. Y., until May, 1921, with the option of renewal for a period of ten years thereafter. The Mohawk Hydroelectric Company is authorized to exercise a franchise granted by the village of Nelliston on Dec. 20, 1910, to supply electricity for lamps and motors in this village. The Mohawk company is also authorized to exercise its franchise granted by the Town Boards of Ephratah and Palatine to erect transmission lines in these towns. The company has also been granted permission to issue bonds to the amount of $56,000 to provide funds for the erection of transmission lines and purchase of equipment necessary to operate under the franchises mentioned.

NEW YORK, N. Y.—Bids will be received by George McAneny, borough president, City Hall, New York, N. Y., until Oct. 23 for furnishing and installing electric lighting and power fixtures and wiring in the city court building, located in the City Hall Park. Blank forms and specifications may be obtained at the office of the auditor, office of the Commissioner of Public Works, 13 Park Row, New York, N. Y.

NEW YORK, N. Y.—Bids will be received by the Department of Public Charities, foot of East Twenty-sixth Street, borough of Manhattan, New York, until Oct. 17 for furnishing and installing pumps, erecting coal railway and pipe-fitting work, etc., for power house, Metropolitan Hospital, Blackwells Island, New York. Blank forms and further information may be obtained at the office of the supervising engineer of the department, foot of East Twenty-sixth Street, New York, where plans and specifications may be seen. Michael J. Drummond is commissioner.

NEW YORK, N. Y.—Bids will be received by the State Commission in Lunacy, 53 Lancaster Street, Albany, N. Y., until Oct. 25 for a new generator and engine at the Manhattan State Hospital, Ward's Island, N. Y., plans and specification for which may be seen and blank forms of proposals obtained at the Manhattan State Hospital, Ward's Island, N. Y., at the office of the State Commission in Lunacy, 1 Madison Avenue.

New York, N. Y., and at the office of Franklin B. Ware, State Architect, Albany, N. Y. Copies of plans and specification may be obtained on application to the State Architect. T. E. McGarr is secretary of State Commission in Lunacy.

NYACK, N. Y.—The Rockland Light & Power Company has submitted a proposition to the Board of Water Commissioners to supply electricity to operate the West Nyack pumping station.

NYACK, N. Y.—The contract submitted by the Rockland Light & Power Company, covering the Pearl River lighting district, for a period of five years has been approved by the Town Board.

ROCHESTER, N. Y.—The Rochester Railway & Light Company is planning to build an extension of its transmission lines from the terminal at Sodus to a point 7 miles east, where a connection will be made with the Northern Wayne Electric Light & Power Company.

ROCHESTER, N. Y.—Sealed proposals will be received by the State Commission in Lunacy, 53 Lancaster Street, Albany, N. Y., until Oct. 25 for rewiring old buildings at the Rochester State Hospital, Rochester, N. Y. Drawings and specifications may be seen and blank forms of proposals obtained at the Rochester State Hospital, Rochester, N. Y., and at the office of the State Architect, Albany, N. Y. Complete sets of plans and specifications may be obtained at the office of Franklin B. Ware, State Architect, Albany, N. Y. T. E. McGarr is secretary of State Commission in Lunacy.

WARREN, N. Y.—The Warren Light & Power Company has filed a notice with the Secretary of State of an increase in capital stock from $200,000 to $500,000. Improvements are being made to the local power house and new machinery installed. The company is a subsidiary of the United Service Company, of Scranton, Pa.

DURHAM, N. C.—The Southern Power Company has completed its transmission line from Rocky Creek to Durham and will be ready to supply electricity here as soon as the mills are ready for the service. The line is about 175 miles long.

DEVILS LAKE, N. D.—The Northern Telephone Company is reported to have secured an option on the property of the Devils Lake Improvement Company, including the local telephone, light and water systems.

DEVILS LAKE, N. D.—At an election to be held Nov. 6 the proposition to issue bonds to the amount of $33,000, the proceeds to be used for the installation of a municipal electric-light plant, will be submitted to a vote.

FARGO, N. D.—It is reported that H. M. Byllesby & Company, of Chicago, Ill., are contemplating extending the Fargo & Moorhead Street Railway to Dilworth.

KENTON, OHIO.—The Kenton Gas & Electric Company has announced that it will build a new plant as soon as possible. The City Council recently notified the company that it must furnish better service or surrender a franchise extension.

LIMA, OHIO.—It is reported that all bids received on Sept. 15 for water-tube boilers of 1600 hp in 200-hp units; six engines, six generators, an eleven-panel switchboard, pumps and pipe were rejected by George E. Whitney, Sec. of Comn. Revised plans and specifications will be ready about Oct. 16.

WOOSTER, OHIO.—Proposals will be received by Charles E. Thorne, director of the Ohio Agriculture Experiment Station, Wooster, Ohio, until Oct. 27 for the construction of an addition to the power house at the Ohio Agriculture Experiment Station. Plans and specifications may be seen at the office of the director of the experiment station.

GROVE, OKLA.—The City Council is reported to have engaged the Western Engineering Company, of Oklahoma City, Okla., to prepare plans for an electric-light plant and water-works system, to cost approximately $35,000.

OCHELATA, OKLA.—Plans are being prepared by the Western Engineering Company, of Oklahoma City, Okla., for the installation of an electric-light plant and water-works system in Ochelata, to cost approximately $15,000.

PONCA CITY, OKLA.—At an election to be held Oct. 31 a proposition to issue $30,000 in bonds, the proceeds to be used for the construction of a municipal electric-light plant, will be submitted to a vote of the people.

DUFUR, ORE.—The installation of a municipal electric-light plant in Dufur is reported to be under consideration.

ELGIN, ORE.—The Eastern Oregon Co-operative Telephone Association, recently organized, and which is to be owned and operated by the business men and farmers of Union County, is planning to install a telephone system in this district immediately. William Parks is president and J. A. Masterson, treasurer.

MEDFORD, ORE.—The contract for installing a cluster-lamp system on Main Stret has been awarded to the Southern Oregon Electric Company, at $37 for each standard and 28 cents a running foot for wiring. The standards are to be of concrete, each carrying three lamps. The system is to be installed by the property owners and to be maintained by the city.

PORTLAND, ORE.—Plans are being considered for the installation of ornamental cluster street-lighting system on Grand Avenue for fifteen blocks.

PORTLAND, ORE.—The Deschutes Rimrock Power Company, recently organized with a capital stock of $1,000,000, is contemplating the development of water-power along the Deschutes River. The company proposes to construct its power plants near the mouth of the river, where they will not conflict with the government's operations on the Deschutes River. The company owns large tracts of land east of the Deschutes River and directly south of the Columbia River, which will be developed and platted out into small farms. It is understood that preliminary plans for construction of the plants have been prepared. It is estimated that 75,000 hp can be developed. It is said that bonds to the amount of $9,000,000 for the company have been underwritten by a London syndicate. M. A. Moody, of The Dalles, Ore., and LeRoy Park, of Portland, Ore., are interested in the project.

SALEM, ORE.—The city has abandoned its suit against the Portland, Eugene & Eastern Railway Company for revocation of the company's franchise for failure to carry out the terms of the franchise. The company agrees to make the improvements asked and to relinquish franchises on streets unoccupied.

SPRINGFIELD, ORE.—The Oregon Power Company is contemplating extensions and improvements to the local water-works system, involving an expenditure of about $15,000. The work will include changing the source of supply and rebuilding pipe line leading from the reservoir on the butte back of the city. The company is also contemplating the installation of complete filtering system.

THE DALLES, ORE.—The Skamania Light & Power Company, of Stevenson, Wash., has submitted a proposition to the City Council offering to supply electricity in The Dalles at a much less rate than is now charged by the Pacific Power & Light Company. Should the city accept the proposition, the city would build its own distributing system, purchasing energy from the Skamania company to operate same. The Skamania company is operating a plant at Stevenson, Wash., and is now installing a hydroelectric power plant on Wind River, which will increase its output to 5000 hp. S. Samson, of Stevenson, Wash., is president of the company and F. Vandovort, chief engineer.

WOODVILLE, ORE.—Bids will be received by the town of Woodville, Ore., until Oct. 27 for $10,000 electric-light and water-works bonds.

PANAMA.—Sealed proposals will be received at the office of the General Purchasing Officer, Isthmian Canal Commission, Washington, D. C., until Nov. 14 for chain fenders for all locks, including steel hawse-pipe castings, cylinders, sheaves, eyebars, structural work, operating valves, pipings and fittings, mechanism for starting and stopping pumps, etc. Blanks and general information relating to this circular (No. 649) may be obtained from the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and 1086 North Point Street, San Francisco, Cal.

ALLENTOWN, PA.—The Lehigh Valley Transit Company has purchased the property of the Montgomery Traction Company, which operates an electric railway from Norristown to Lansdale, and has 14 miles of track. The Montgomery company is capitalized at $250,000 and has a bonded indebtedness of same amount. This purchase gives the Lehigh Valley Transit Company the last link for its proposed high-speed line from Sixty-ninth and Market Streets, Philadelphia, to Delaware Water Gap, a distance of about 100 miles. The property will be rebuilt on a high-speed basis from Norristown to North Wales or Lansdale.

EASTON, PA.—Arrangements have been made by the Northampton Traction Company to purchase energy from the Eastern Pennsylvania Power Company to operate its system.

ETNA, PA.—The Borough Council has awarded the contract for the construction of the power house to Walker & Curley. The building will be 34 ft. x 85 ft., and 22 ft. high.

HOPE, R. I.—The village of Hope has awarded a contract to the Narragansett Electric Lighting Company, of Providence, R. I., for the installation of a street-lighting system in Hope. The contract calls for the erection of twenty-five lamps in certain sections of the village.

PROVIDENCE, R. I.—The Narragansett Electric Lighting Company has announced a reduction in the price of electricity for incandescent lamps from 12 cents to 10 cents per kw-hour, to take effect after Oct. 31. This is the second reduction made by the company within sixteen months.

COLUMBIA, S. C.—The Columbia Electric Street Railway, Light & Power Company has applied to the City Council for a franchise to change and extend some of its tracks in Columbia.

GREENVILLE, S. C.—Arrangements are being made for the initial equipment of machinery to test the method to be used by the Clayton Linen Mills of Greenville. The company expects later to erect buildings for a 7000-spindle plant, to be operated by electricity. Raven L. McDavid is president.

CHAMBERLAIN, S. D.—Negotiations have been closed by Guy M. Pratt, of Omaha, Neb., general manager of the Nebraska Telephone Company, for the purchase of all telephone lines running out of Chamberlain and including the local exchange. The Bell Company has also purchased several other lines west of the Missouri River, among them being the Western Telephone Company, Dallas; the Trotter line, which extends from Stuart through Norfolk to Gregory, and the Cherry line in northern Nebraska, which gives the company almost complete control of the telephone business west of the Missouri River in South Dakota as well as northwestern Nebraska.

RAPID CITY, S. D.—Plans are being considered by local business men for the construction of an electric railway from Rapid City to Butte, Newell County, a distance of 47 miles. The proposed railway would cost approximately $500,000.

TABOR, S. D.—An electric-light plant has been installed by a local firm of sufficient output to supply electricity for lighting its own place of business and several other business houses in Tabor. It is expected that the system will be extended to provide the entire town with electricity for lamps.

ALAMO, TENN.—B. W. Chapman, it is reported, is interested in a project to install an electric plant in Alamo.

CHATTANOOGA, TENN.—The Tennessee River Power Company, which is constructing a hydroelectric power plant at Hales Bar, 15 miles from Chattanooga, expects to have it completed early in the summer of 1912. The power house is 354 ft. long and 66 ft. wide, of steel and concrete construction.

LONSDALE, TENN.—The City Council has decided to increase the number of electric lamps in the southern part of the city. The Knoxville Railway & Light Company furnishes electrical service in this city.

BASTROP, TEX.—The City Council is reported to have entered into a contract with the Bastrop Water & Light Company whereby improvements will be made to the street-lighting system. It is proposed to place 500-cp lamps in part of the business district of the city and 100-cp lamps in the residence section.

CARRIZO SPRINGS, TEX.—It is reported that the new electric plant in Carrizo Springs has been completed. It is proposed to light the streets by electricity. Arrangements are now being made to install the street-lighting system.

CUERO, TEX.—The Cuero Electric Light Company is installing additional machinery in its power house at the dam on the Guadalupe River to provide for the increasing demands for electrical service.

EL PASO, TEX.—The El Paso Gas & Electric Company has filed amendment to its charter increasing its capital stock from $545,000 to $595,000.

MENARD, TEX.—The city is reported to have awarded a contract to construct an electric-light plant and water-works system in Menard to Clarke & Burge, of Chicago, Ill.

MEXIA, TEX.—It is reported that plans are being considered for the installation of a new engine and generator in the local power plant.

MISSION, TEX.—Samuel Robertson, acting for the San Benito Interurban Railway Company, is reported to have contracted to build an interurban railway from Mission to Monte Cristo, a distance of 15 miles.

ORANGE, TEX.—Arrangements are being made by the Yellow Pine Paper Mill Company for the erection of the new transmission line between the power plant and paper mill.

SAN ANTONIO, TEX.—The San Antonio Gas & Electric Company has announced a reduction in the price of electricity for lamps to take effect at once. Under the new schedule the rates are as follows: For the first 25 kw-hours the price is 14 cents per kw-hour; for the next 75 kw-hours 8 cents per kw-hour; 6 cents for the next 900 kw-hours, and 5 cents for all over 1000 kw-hours. For power 5 cents per kw-hour for the first 500 kw-hours; 4 cents for the next 500 kw-hours, and 3 cents for all over 1000 kw-hours. The reduction was voluntary on part of the company.

WACO, TEX.—The City Commissioners have awarded the Waco Gas & Electric Company a contract for the installation of 100 additional arc lamps in the city.

NORFOLK, VA.—Announcement has been made by the officials of the Virginia Passenger & Power Company that improvements will be made to the local system, involving an expenditure of about $1,000,000. The proposed improvements will include the erection of new steel car barns, to cost $125,000; new rolling stock, $50,000; and about $200,000 for improvements to tracks and the erection of new terminals at Ocean View and Willoughby Bend.

RICHMOND, VA.—The Virginia Railway & Power Company has authorized an expenditure of $1,100,000 for improvements and extensions to its system in Richmond, of which $700,000 will be used for construction of power house at the foot of Twelfth Street and additional transmission lines. The building will be 150 ft. by 120 ft., of concrete or brick construction. The equipment will include eight 600-hp boilers, 9000-kw turbine, condenser, switchboard, transformers, rotaries, coal and ash-handling equipment and two stacks 250 ft. x 12 ft. Provision will be made for trebling the output of the plant as needed. The remaining $400,000 will be used for replacing tracks on Broad, Main and other streets and electric welding of rails throughout the city. William Northrop is president of the company.

BLAINE, WASH.—Preparations are being made by the British Columbia Electric Company to erect a transmission line from Cloverdale, B. C., to Blaine.

BURLINGTON, WASH.—The Bellingham & Skagit Interurban Railway Company has been granted a franchise to construct and operate an electric railway in Burlington. The Stone & Webster Engineering Corporation are said to be interested in this company.

ELLENSBURG, WASH.—Plans are being considered by the Ellensburg Woolen Mills for the erection of two buildings. The installation of a heating and power plant is also contemplated. J. F. McAfee is superintendent.

HUSUM, WASH.—The Pacific Power & Light Company has applied for a franchise to erect a transmission line from Husum to Underwood.

OXBOW, WASH.—Work will soon begin on the construction of an electric railway from Oxbow to Lake Burien. W. H. Coughlin, of Seattle, Wash., is interested in the project.

PASCO, WASH.—The City Council has awarded a contract to the National Harvester Company, of Spokane, Wash., for the installation of an ornamental street-lighting system in the business section and part of the residential portion of the city. The contract calls for 86 lamp standards, each carrying three lamps.

SEATTLE, WASH.—The Board of Public Works has instructed City Engineer R. H. Thomson to prepare plans for the Seattle-Renton municipal electric railway, the cost of which is estimated at about $800,000.

SEATTLE, WASH.—Application has been made to the Board of County Commissioners by Roy W. Comegys for a franchise to erect transmission lines for the distribution of electricity in certain sections of the county.

SNOHOMISH, WASH.—Plans are being considered for the installation of a new street-lighting system in Snohomish. Several propositions have been submitted by the Everett Gas Company, owner of the local system. The company recommends the installation of thirty-five magnetite luminous arc lamps, at a cost of $72 each per year.

TACOMA, WASH.—The Griffin Wheel Company has awarded a contract to the Evans-Dickson Company for the installation of an electric-lighting system at its plant.

VANCOUVER, WASH.—Application has been made to the City Council by the Skamania Light & Power Company for a franchise in Vancouver to supply electricity for lamps and motors. S. Sampson, of Stevenson, Wash., is president of the company.

ELLENBORO, W. VA.—Work has commenced on the construction of the new power house of the American Undercurrent Company at Lumberton. O. E. Longdorf, of Pittsburgh, is president of the company.

FOLLANSBEE, W. VA.—The Steubenville & East Liverpool Railway & Light Company has extended its system to Follansbee and is now supplying electricity for lighting the residences in the town. The company has a contract for street lighting here and will soon begin work on installation of same.

KIMBALL, W. VA.—The Town Council has granted I. Tobin a franchise to install an electric-light plant and water-works system in Kimball. The franchise also gives him the right to operate street car lines in the town. At present the King Coal Company supplies electricity in the town.

LA CROSSE, WIS.—Part of the large dam of the La Crosse Water Power Company, located at Hatfield, on Black River, 5 miles above Black River Falls, was carried away by the flood on Oct. 6, causing great damage to the $2,000,000 power plant of the company and practically destroying the village of Black River Falls. The dam was 110 ft. thick at the bottom, 50 ft. thick at the top and 30 ft. high, and cost $500,000.

MILWAUKEE, WIS.—Bids for the construction of an electric-light plant adjoining the garbage incinerator have been received by Public Works Commissioner Harry E. Briggs. The plant will use waste steam to generate electricity.

MILWAUKEE, WIS.—The Milwaukee Electric Railway & Light Company has applied for a franchise to extend its Farwell Avenue line from Mineral Springs Road to Marion Street. It is proposed to reach the newly built lake bluff territory.

STOUGHTON, WIS.—The contract for the construction of the new power house for the municipal electric plant has been awarded to George W. Becker, of Stoughton. The installation of two 125-hp water-wheels, with governor and controlling machinery, is nearly completed. The work was done by the Power Engineering Company, which also has the contract for placing the generator and exciter in position.

INNISFAIL, ALTA., CAN.—A by-law authorizing the Council to appropriate $15,000 for the construction of an electric-light plant in Innisfail will be submitted to the ratepayers.

KAMLOOPS, B. C., CAN.—The proposition to expend $223,000 to secure hydroelectric power from the Barrier River is reported to be under consideration.

PRINCE RUPERT, B. C., CAN.—William Mahlor Davis, of Prince Rupert, chief engineer, will have charge of the construction of the proposed municipal electric-light plant and water-works system for Prince Rupert, for which a by-law appropriating $550,000 was recently passed. Ernest A. Woods is city clerk.

VANCOUVER, B. C., CAN.—The Western Canada Power Company has been granted permission to deliver electricity to the amount of 5000 kw-hours per annum to the Whatcom Railway & Light Company, at Sumas, Wash. The license was granted by the Inland Revenue Department, at Ottawa, and is for a period of one year.

WINNIPEG, MAN., CAN.—The new municipal power plant, located at Point du Bois, 70 miles from Winnipeg, has been placed in operation and now supplies 60,000 hp. The cost of the plant was about $5,000,000. Steps have been taken to double the output of the plant when needed.

HALIFAX, N. S., CAN.—The Nova Scotia Car Works, it is reported, is contemplating enlarging its power plant. The equipment to be installed will include one 600-hp Corliss engine for direct connection to electric generator, three 200-hp return tubular boilers with self-supporting steel smoke stack 5 ft. in diameter, 90 ft. high, feedwater heater, piping, etc. The Robb Engineering Company will have charge of the work.

LINDSAY, ONT., CAN.—At an election held recently the ratepayers voted in favor of the by-law granting the Electrical Power Company, Ltd., a franchise to supply electricity in Lindsay. Two by-laws were submitted to the people, one to give the franchise and the other to purchase the local plant to be owned and operated by the municipality.

MONTREAL, QUE., CAN.—The property of the Montreal Street Railway Company has been transferred to the Montreal Tramways Company, which was recently organized with a capital stock of $20,000,000 for the purpose of taking over the Montreal Street Railway Company, the Montreal Park Island Company, the Montreal Terminal Railway and the Public Service Corporation. Announcement has been made that the Montreal Tramways Company has sold $10,000,000 in bonds to provide funds in connection with taking over the property of the Montreal Street Railway Company and for retirement of part of the latter company's bonds.

PACHUCA, MEX.—The West Mexican Mines Company, operating the Rosario mine, is contemplating the installation of a new air compressor and electric hoisting machinery.

New Industrial Companies.

THE ACKLEY BRAKE & SUPPLY COMPANY, of New York, N. Y., has been incorporated by Griffin S. Ackley, John C. Raymond, both of Hudson Terminal Building, New York, N. Y., and Helen T. Ackley, of Elmwood Avenue and Anderson Place, New York, N. Y.

THE BAILEY ELECTRICAL SUPPLY COMPANY, of New York, N. Y., has been incorporated by Siegel & Siegel, Isadore Steinberg, Leon Portnow and Anna Bailey. The company is capitalized at $5,000.

THE BOSTON SMOKELESS DRAFT INDUCER & ECONOMIZER COMPANY, of Boston, Mass., has been incorporated with a capital stock of $50,000 for the purpose of manufacturing draft inducers. G. A. Cooley, of Melrose Highlands, Mass., is president, and M. B. Gay, of Portland, Maine, treasurer.

THE DENISON SALES COMPANY, of Providence, R. I., has been incorporated with a capital stock of $10,000 to manufacture and distribute electrical and mechanical appliances, automatic musical instruments, etc. The officers are: William Henry Doris, president; Clyde Alwyn Bennett, vice-president and general manager, and Charles Carroll De Goey, 388 Blackstone Street, Providence, R. I., treasurer.

THE ELECTRICAL DEPARTMENT COMPANY, of Los Angeles, Cal., has been incorporated with a capital stock of $10,000 by Frank L. Borden, B. E. Fanning, J. C. Rendler, Hans Grass and R. W. Stephens.

THE ELECTRIC SCORE BOARD COMPANY, of Boston, Mass., has filed articles of incorporation with a capital stock of $100,000. The incorporators are: George E. Baird, Frank C. Baird, John E. Donahue and Frederick B. Osborne. The company proposes to manufacture electrical appliances.

New Incorporations.

CADIZ, OHIO.—The Cadiz Traction Company has been granted a charter with a capital stock of $10,000 to construct and operate an electric railway in Cadiz. The incorporators are: Robert P. Scott, B. W. Rowland, C. S. Scott, R. C. Pittus and Thomas Scott.

CINCINNATI, OHIO.—Articles of incorporation have been filed for the Great Miami River Electric Company by Edward Schlesinger, Walter C. Taylor, James B. O'Donnell, E. P. Lamping and R. C. Cronin, all of Cincinnati, Ohio. The company is capitalized at $10,000 and proposes to build dams along the Great Miami River to furnish power to generate electricity and build canals, locks and raceways. The company will operate in Hamilton, Butler, Montgomery, Shelby and Warren Counties.

NEW WASHINGTON, OHIO.—Articles of incorporation have been filed for the Cranberry Home Telephone Company with a capital stock of $10,000 by W. A. High, J. H. Donaldson, A. G. Lederer, O. L. Green and John H. Sharp.

Personal.

MR. ROBERT W. ROLLINS, manager of the Hartford (Conn.) Electric Light Company, has been appointed general manager of the Worcester (Mass.) Electric Light Company.

MR. H. KENT McCAY has resigned as president of the McCay Engineering Company, of Baltimore, to accept the post of chief engineer of the city of Baltimore. Mr. McCay will act as consulting engineer of the engineering company.

MR. A. L. NICHOLS has resigned as superintendent and chief electrician of the municipal light plant, Independence, Kan. Mr. J. M. Kent, of Kansas City, Mo., has been appointed consulting engineer to aid in conducting the lighting business in Independence.

MR. F. B. CHAPMAN, who was with the National Carbon Company, and formerly represented Machado & Roller, on the 1st of October joined the commercial staff of the Bryant Electric Company. Mr. Chapman will represent that company in New York State and New England.

MR. E. HEINEKE, chief electrician for the American Smelting & Refining Company at Santa Barbara, State of Chihuahua, Mexico, who is returning from a vacation abroad to his former home in Alsace-Lorraine, Germany, will spend several weeks in Chicago investigating American shop and repair methods.

MR. A. MILLER BELFIELD, a patent attorney of Chicago, gave a talk on some of the interesting business customs observed during a recent trip abroad at the noon luncheon of the Purdue Alumni Association of Chicago, Oct. 5. Mr. Belfield was an 1892 graduate of the electrical school of Purdue.

MR. F. W. WILLCOX, of the Edison Lamp Works, who went abroad in the spring, will remain for some time with the British Thomson-Houston Company, London and Rugby, in connection with special work in the development and extension of the incandescent lamp business of that company. The address of Mr. Willcox is 83 Cannon Street, London, E. C.

MR. MASON B. STARRING, formerly president of the Northwestern Elevated and Chicago & Oak Park Elevated Railways, Chicago, has been elected president of the United Railways Investment Company, of New York, which controls electric-railway lines in Pennsylvania and California. Mr. Starring's salary in his new position is reported to exceed $50,000 yearly.

MR. GARRETT T. SEELY, of Chicago, formerly manager of the South Side Elevated Railroad Company, has been made assistant general manager of the Metropolitan West Side Elevated Railway Company, the Northwestern Elevated Railroad Company and the South Side Company, the change growing out of the association of the companies in the Chicago Elevated Railways.

MR. R. HANSCHKE, JR., graduate of A. & M. College of Texas and the University of Hanover, Germany, has been appointed Eastern representative of the Charles L. Kiewert Co., Milwaukee, Wis., the well-known importers of all kinds of flaming, searchlight and "Bio" carbons, and Alba and Aurola flaming arc lamps. Mr. Hanschke's office address is 165 Greenwich Street, New York City.

MR. ALVIN J. FORBES, formerly superintendent and chief electrician of the Lytle Creek Power Company, San Bernardino, Cal., has been appointed superintendent of the Southern Sierra Power Company. He will be engaged in the construction of transmission lines throughout San Bernardino and Riverside Counties. His successor will be Mr. B. F. Himes, city electrician and electrical inspector, San Bernardino.

PROF. HAROLD B. SMITH, of Worcester Polytechnic Institute, was married Sept. 28 to Miss Persis H. Smith at the home of the bride's parents in New York City. Professor and Mrs. Smith sailed Sept. 30 from New York by the North German Lloyd steam *Prinzess Irene* for an extended trip through Africa, Asia and Europe. The second year of Professor Smith's leave of absence from the Worcester Polytechnic will be spent in study in Zurich and Berlin.

MR. J. S. CODMAN, formerly associated with the Holophane Company with headquarters in Boston, has become financially interested in the manufacture of electric vehicles and will hereafter be identified with S. R. Bailey & Company, Amesbury, Mass. Mr. Codman, who has taken an active part in the development of illuminating engineering, has served as vice-president of the Illuminating Engineering Society and was recently elected a manager of the New England Section of the society.

MR. C. NESBIT DUFFY, comptroller of the Milwaukee Electric Railway & Light Company, is a man of varied activities, and among other things he is vice-president of the board of regents of Marquette University, Milwaukee. A public dinner was given at the Hotel Pfister on Oct. 1 in honor of Rev. Joseph Grimmelsman, S.J., president of the university, and Mr. Duffy introduced the toastmaster of the evening. Governor McGovern, President Van Hise of the University of Wisconsin and other distinguished guests were present.

MR. CHARLES S. DAVIS has resigned as general manager of the Marlboro (Mass.) Electric Company to become associated with the Westinghouse Lamp Company with headquarters at Bloomfield, N. J. Mr. Davis, who is a graduate of the Massachusetts Institute of Technology, has served as assistant electrician for the Boston & Maine Railroad, as master electrician of construction at the Charlestown Navy Yard, as engineer for the Holtzer-Cabot Electric Company and as a member of the executive board of the Marlboro Board of Trade.

MR. WILLIAM NEWELL, who has been appointed mechanical engineer of the Bureau of Factory Inspection of the Department of Labor of New York State, was formerly assistant superintendent of the Liability Department of the Fidelity & Casualty Company, of New York, and has made a special study of accident prevention. Mr. Newell graduated and received the degree of mechanical engineer from Columbia University in 1907 and is a member of the A. S. M. E. and the Industrial Safety As-

sociation. With Mr. F. E. Law, vice-president of the Fidelity Company, he is co-author of the book "The Prevention of Industrial Accidents."

MR. EDWARD W. LLOYD, general contract agent for the Commonwealth Edison Company, Chicago, was the victim of a painful accident on Sept. 30. In company with Mr. Peter Junkersfeld and two other gentlemen he was inspecting some electrical work in a building being remodeled. The four were standing on a temporary walk made of planks supported on the new steel framework when the plank supporting their weight broke in two without warning. Mr. Junkersfeld being nearest the end managed to grasp the framework and so escaped with slight injury, but the others were precipitated to the concrete floor, 15 feet beneath. Mr. Lloyd picked himself up and did not realize at the time that he was hurt much, but later he discovered that he was bruised severely about the body, with the possibility that some of his ribs were cracked. He has been confined to the house since, but at the last report was improving nicely, and it is probable that he will have recovered entirely by the time this is printed.

MR. P. T. GLIDDEN, general manager of the Louisville Lighting Company, who assumed his duties Oct. 2, was born in Massachusetts in 1869, and from early manhood has been identified with the electrical business. From 1889 to 1893 he was with the Holtzer-Cabot Company of Boston, leaving the employ of that company to go with the Schaeffer Electrical Company of that city, of which he became superintendent in the manufacture of incandescent lamps. Mr. Glidden joined the staff of the New York Edison Company in 1895, with which he remained for eight years, part of the time being in the operating department, but most of it in the commercial end of the business. In 1903 he was with the Ohio Brass Company, manufacturers of electrical supplies. The following year he became manager of the new business department of the Binghamton Light, Heat & Power Company. After a year and a half he was elected vice-president and general manager. While retaining the management of the Binghamton company he was made vice-president and general manager of the Eastern Pennsylvania Power Company, of Easton, Pa. He left this position to become general manager of the Louisville Lighting Company. Mr. A. M. Worthington, whom he succeeds, remains until Oct. 15, and will then go to California, where it is hoped that his health will greatly improve.

MR. HAROLD S. BUTTENHEIM, for several years secretary of the McGraw Publishing Company, and at present connected with the David Williams Company as second vice-president, is about to sever his connection with the latter company to take up another branch of publishing work. For some years past Mr. Buttenheim has been making a study of problems relating to municipal government and civic advance. With the rapid spread of the commission government idea, the growing activities of commercial organizations in civic work, and the increasing demand for better conditions in our cities generally, he believes the time has now come when a paper devoted to such subjects can be made a real success. These reasons led Mr. Buttenheim to purchase recently, with his brother Edgar J. (formerly circulation manager of the David Williams Company), the magazine called *The American City*, established in New York some two years ago and published at 93 Nassau Street. Mr. Harold S. Buttenheim will take the editorship of the paper, while the business management will be under his brother's direction. The progress of *The American City* is further assured by the addition to its staff of Mr. James H. Van Buren, who has resigned his position as eastern advertising representative of the *Municipal Journal and Engineer* to become advertising manager of *The American City*. Mr. Buttenheim's successor as manager of *Iron Age-Hardware* is Mr. Roy F. Soule, already well known to the hardware fraternity as the author of the "Assistant Manager" articles which have been a regular feature of *Iron Age-Hardware* for more than a year past.

Trade Publications.

CABLE SPECIALTIES.—W. N. Matthews & Brother, 219 North Second Street, St. Louis, have issued leaflets relating to various cable specialties, including rollers, clips, splicing joints and fault-finders. A special leaflet is devoted to the "Telefault" instrument for locating high resistance or leaks on short-circuits in cables. Boltless guy clamps which can be installed in two minutes are described in another leaflet.

TRANSFORMERS.—A new, handsome and comprehensive catalog of "High-Efficiency Transformers" has been issued by the Moloney Electric Company, of St. Louis and Windsor, Ont. Transformers for lighting and motor service of the single-phase and three-phase, subway and station types are illustrated and described, as well as instrument transformers, variable-voltage transformers and tungsten-sign-lamp transformers. Details of manufacture are fully discussed and the various methods of testing for core and copper loss are explained. Phase and bank connections are clearly shown by diagrams. Moloney transformers are made in sizes up to 5000 kw and for any voltage.

FUEL ECONOMIZERS.—"Economical Steam Power Plants" is the title of a 24-page pamphlet reprinted from the technical journals and issued by the Green Fuel Economizer Company, of Matteawan, N. Y. Four of the largest modern steam-power plants, viz., the Hudson & Manhattan Power Station in Hoboken, N. J., the 120,000-hp St. Denis plant near Paris, the plant of the Laclede Power Company, St. Louis, and the electric plant at Vitry-sur-Seine, are described. The pamphlet ends with a fifth paper on "Economizer Practice," discussing the theory of the lowest economical difference in temperature between the gases entering the chimney and the cold boiler-fed water. It is shown that whereas there is little economy in reducing the temperature of chimney-flue gases lower than 500 to 550° F. by means of boiler surface, the temperature of the same gases may be reduced to 200° F. or 250° F. quite profitably by means of economizer surface, because of the lower temperature of the contents of the economizer and the less costly nature of the economizer surface.

BUSINESS NOTES.

MR. JAMES R. DEANE, 528 McCormick Building, Michigan Avenue and Van Buren Street, Chicago, has taken the local agency for the "High Efficiency" transformers manufactured by the Moloney Electric Company, St. Louis, Mo.

THE TRIUMPH ELECTRIC COMPANY, of Cincinnati, Ohio, shipped last week a carload of equipment, including several large generators and motors, to Pekin, China. Inquiries and orders have also been received from India, Cuba and New Zealand. The company reports that during the past six months the sales have aggregated more than 50 per cent over the previous ten years' average.

SIGN PROJECTORS.—Indicating that the field for the sale of electrical advertising specialties is immense and has hardly begun to be developed, the Sanitary Specialty Company, of Louisville, which sells electrically operated devices of various kinds, reports that it has sold 350 sign projectors to retail merchants in that city. There was comparatively little publicity given the device, which made an instantaneous hit.

TRANSFORMERS FOR CHICAGO STREET LIGHTING.—The Delta-Star Electric Company, of Chicago, Ill., is delivering the first installation of Pittsburgh transformers on its contract closed with the Sanitary District for a large number of 12,000-volt, 250-kva units, to be used in the new street-lighting system. These transformers are of an improved type, having extremely high insulation strength and mechanical rigidity.

SWITCHBOARD METERS FOR UNITED STATES NAVY.—The Sangamo Electric Company, of Springfield, Ill., has recently shipped forty large-capacity, shunted-type, mercury-flotation, watt-hour meters to be installed on eight large battleships and cruisers including the *Connecticut, Montana, Tennessee, Florida* and *North Carolina*. These meters were ordered after a long service test on the battleship *North Dakota* and other vessels are to be equipped in the near future. Experience has shown that the mercury-flotation feature is of peculiar value in locations subject to vibrations or shocks, such as are encountered in battleship practice.

FIRE IN HOLTZER-CABOT WORKS.—The Brookline plant of the Holtzer-Cabot Electric Company was damaged by fire on the night of Oct. 6. The principal injury was to the offices and executive departments, the machinery wings being practically unharmed, except by water. The motor department is located in a separate building on Albany Street, Boston, and hence escaped damage. For the time being the company's headquarters and offices are located at 94 Washington Street, Brookline. The damaged workrooms are being rehabilitated, and the officers of the company state that orders will be cared for and deliveries made with slight delay.

RECENT LAMP BUSINESS OF THE BOSTON INCANDESCENT LAMP COMPANY.—The Boston Incandescent Lamp Company, manufacturers of refilled carbon incandescent lamps, reports that it has booked a larger volume of business during the month of September than during any previous month in its history. This company, which sells lamps at minimum prices for standard types and voltages in the carbon filament class, attributes its growing business to the fact that while there is a rapidly increasing demand for high-efficiency incandescents, there is, and perhaps always will be, a legitimate place for lamps of comparatively low efficiency at a very low price.

BAILEY ELECTRIC VEHICLE.—Messrs. S. R. Bailey & Company, of Amesbury, Mass., have made a two-passenger roadster electric automobile of very novel design and are at work on a four-passenger car of the same design. The cars have the center of gravity less than 18 in. from the ground, yet the road clearance is 10 in. The cars are built on graceful lines. They are designed especially for official work of public-service corporations. Their particular merit consists in their ability to cover distances of vaying length at a speed greater than hitherto attained. The space provided for battery equipment is unusually large and enables an equipment of elastic size to be used in the same car.

TRUMP TURBINES.—The Trump Manufacturing Company, Springfield, Ohio, has just been awarded a contract by the Northern Ohio Power Company, Cleveland, Ohio, for three horizontal water wheels, each unit directly connected to Westinghouse generators of 500-kw capacity, these turbines to operate under a head of 100 ft. The city of Rutherfordton, N. C., has awarded a contract for a pair of horizontal Trump turbines in steel casings, these turbines to be directly connected to Westinghouse generators. The turbines, which will develop 200 hp at 600 r.p.m. under a 53-ft. working head, are fed by a steel feeder pipe 36 in. in diameter approximately 100 ft. long. The speed of the wheels is controlled by a Woodward governor.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED OCT. 3, 1911.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York.]

1,004,557. RESISTANCE FURNACE; W. D. Coolidge, Schenectady, N. Y. App. filed Dec. 3, 1907. Inert gas is passed through a tungsten resistance tube.

1,004,556. SELECTIVE SIGNALING DEVICE; Edwin R. Gill, Yonkers, N. Y. App. filed Sept. 4, 1908. Electromagnetic device for telegraph and telephone work. (See No. 906,523.)

1,004,567. SELECTIVE SIGNALING SYSTEM; Edwin R. Gill, Yonkers, N. Y. App. filed March 28, 1910. Combined telephone and telegraph for train dispatching, etc. A metallic line with grounds.

1,004,571. PORTABLE SMOOTHING IRON; A. E. Hollingshead, Minneapolis, Minn. App. filed Dec. 5, 1910. An egg-shaped heating head.

1,004,599. ARMATURE FOR ELECTRIC GENERATORS; J. Splitdorf, New York. App. filed June 14, 1910. New form of head with curved ends and cross arms and windings.

1,004,608. ELECTRIC WATER-HEATING APPARATUS; J. G. Wallman, Oakland, Cal. App. filed August 25, 1910. A plurality of electrodes having concavo-convex surfaces are suspended in a boiler.

1,004,618. TROLLEY HEAD; J. J. Bennett, Pittsfield, Mass. App. filed Jan. 21, 1911. Removable wheel and shaft carried by a revolvable harp.

1,004,657. REFILLABLE FUSE; F. H. Kaiser and J. C. Clemens, Buffalo, N. Y. App. filed March 8, 1911. The fuse wire is held in sockets inside of a fiber tube.

1,004,673. PROCESS OF AND APPARATUS FOR MAKING CLAD METALS; J. F. Monnot, N. Y. App. filed Dec. 23, 1908. Electro deposited at a temperature above the melting point of the metal deposited.

1,004,681. LIGHTNING-ROD CABLE; E. H. Parker, New York. App. filed Dec. 23, 1910. Braided wires are twisted together.

1,004,740. ELECTRIC ALARM; P. A. Brown, Denver, Colo. App. filed Sept. 22, 1908. A number of cartridges are exploded successively.

1,004,748. WAVE DETECTOR; J. L. Creveling, New York. App. filed May 24, 1907. Adjustable electrode. Improvement on patent No. 761,450.

1,004,767. COMBINED TELEGRAPH, SIGNAL AND TELEPHONE SYSTEM; W. A. Froeckman, St. Louis, Mo. App. filed May 5, 1910. Arrangement to notify substations of a break and its location.

1,004,780. ELECTRIC CONTROLLER; J. H. Hall, Cleveland, Ohio. App. filed July 27, 1911. For reversing two compound-wound motors working in parallel.

1,004,785. TROLLEY ATTACHMENT; J. P. Henderson, Sharon, Pa. App. filed Nov. 29, 1909. Winding drum for retracting the pole and a magnetic release.

1,004,793. MANUFACTURE OF ELECTRODES FOR SECONDARY BATTERIES OR STORAGE CELLS; V. de Karavodine, Billancourt, France. App. filed Oct. 5, 1910. Lead sulphate is treated with ammonia and water and then electrolyzed in an alkaline bath.

1,004,795. ELECTRIC WELDING; L. S. Lachman, New York. App. filed Oct. 15, 1908. A countersink in one and a projection on the other piece are brought together for butt welding rods to larger bodies.

1,004,811. TROLLEY FROG AND CROSSING; R. E. Noble and L. E. Mitchell, Chicago, Ill. App. filed June 11, 1909. Clamp to hold the wire to the frog and an inclined guide for the trolley wheel.

1,004,825. ELECTRIC CONTROLLER; H. F. Stratton, Cleveland, O. App. filed April 6, 1911. A rheostat for controlling the field current of a motor for acceleration.

1,004,826. SYSTEM OF ELECTRICAL DISTRIBUTION; A. M. Taylor, Birmingham, Eng. App. filed Jan. 23, 1906. A private storage system to equalize a power load at the consumer's plant.

1,004,846. ELECTRICALLY-OPERATED ANNUNCIATOR; F. W. Bost and B. Gobel, China Grove, N. C. App. filed Oct. 19, 1909. Drop annunciator for burglar alarm.

1,004,860. SOLENOID WITH SHUNT; A. C. Eastwood, Cleveland, O. App. filed June 7, 1910. Motor control. Brake winding in series with a motor circuit and a shunt around the winding with a switch.

1,004,879. SIGNALING SYSTEM FOR MINES; E. M. Johnson, Hancock, Mich. App. filed Sept. 9, 1907. The signals transmitted from any level to the hoisting engineer are indicated at all of the other levels.

1,004,884. CURRENT COLLECTOR FOR ELECTRICALLY PROPELLED VEHICLES; W. Kohler, Bremen, Germany. App. filed March 17, 1910. For trackless trolleys with two superimposed overhead wires.

1,004,923. METHOD OF HEATING CARBON; W. A. Smith, Niagara Falls, N. Y. App. filed Dec. 20, 1910. The carbon or coke passes through a furnace parallel to the direction of current.

1,004,924. ELECTRIC-RESISTANCE FURNACE; W. A. Smith, Niagara Falls, N. Y. App. filed Dec. 20, 1910. A vertical shaft with one electrode in the upper end and the other axially arranged lower down so that the charge passes it.

1,004,943. ELECTRIC-PUMP GOVERNOR; W. V. Turner, Edgewood, Pa. App. filed Oct. 30, 1908. A switch is pneumatically operated by the same air pressure that causes the blow out.

1,004,946. JUNCTION BOX; J. Wares and J. W. Kippen, Pullman Sta., Ill. App. filed Aug. 18, 1910. Fire and water proof box with a distribution board.

1,004,956. ELECTRIC BED WARMER; J. Alden, Boise, Idaho. App. filed May 13, 1910. A casing containing an incandescent lamp.

1,004,962. TROLLEY HARP; J. T. Archer, Champaign, Ill. App. filed July 11, 1910. The harp is pivoted so as to be tiltable on the pole.

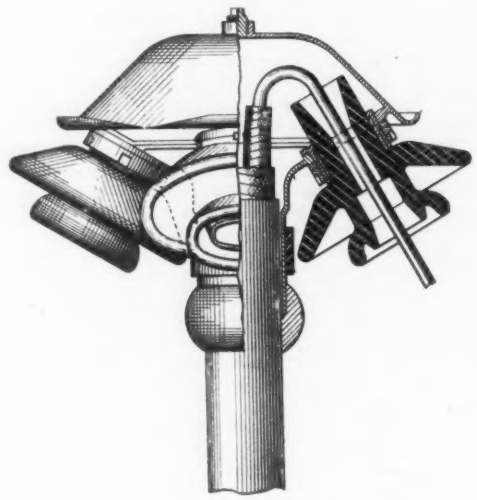
1,004,995. TELEPHONE INSTRUMENT; P. B. Clarke, Liverpool, Eng. App. filed Dec. 27, 1910. A tapered casing forming a mouthpiece.

1,005,002. TERMINAL FOR ELECTRICAL CABLES; C. W. Davis, Edgeworth, Pa. App. filed May 8, 1909. A divided casing with a central inlet and radial outlets.

1,005,003. TERMINAL STRUCTURE FOR ELECTRICAL CABLES; C. W. Davis, Edgeworth, Pa. App. filed July 1, 1909. A capped casing with an inlet and outlets with a petticoat.

1,005,004. MAIL-BOX ALARM; G. H. Diemer, Trinidad, Colo. App. filed Feb. 21, 1910. For rural free delivery boxes to give an alarm in the house.

1,005,007. METHOD OF TREATING MOLDS USED IN THE ART OF ELECTROTYPING; George E. Dunton, New York, N. Y.



1,005,002.—Terminal for Electrical Cables.

App. filed July 22, 1910. The mold is subjected to a grease solvent before plating.

1,005,008. SELF-REGISTERING TARGET; M. St. C. Ellis, U. S. Navy. App. filed June 1, 1910. Segmental target with electric-signal device. Improvement on No. 804,712.

1,005,023. ATTACHMENT PLUG; G. W. Goodridge, Bridgeport, Conn. App. filed July 16, 1910. Formed of porcelain buttons and metallic parts held together by a tubular rivet.

1,005,033. LIGHTNING ARRESTER; J. D. Hilliard, Jr., and C. E. Parsons, Glens Falls, N. Y. App. filed Aug. 22, 1906. A normal air gap is in series with an automatic break device shunted by a secondary air gap.

1,005,060. TWO-STEP KNIFE SWITCH; W. Muirhead, Jr., New York. App. filed April 26, 1911. To shunt motor running fuses when starting and maintain the circuit when changing to the running step.

1,005,084. ELECTRICAL CONTROLLER; J. G. P. Thomas, Chiswick, Eng. App. filed Feb. 3, 1910. The circuit controlling drum rotates in a casing containing oil.

1,005,107. AUTOMATIC VOLTAGE REGULATOR; G. D'Eustachio and P. von Lehoczky, Pittsburgh, Pa. App. filed Nov. 14, 1907. For the feeding points of alternating-current circuits.

1,005,119. ATTACHMENT PLUG FOR ELECTRIC WIRES; W. C. Tregoning, Cleveland, O. App. filed Nov. 18, 1909. Two-part porcelain connected by a screw and provided with a strain relief.